Light and Lighting

XIX.—No. 7. July, 1936 Price 9d

ORPORATING "THE ILLUMINATING ENGINEER"

THE SCIENCE OF SEEING

BETTER LIGHT

BETTER SIGHT

It is estimated that the average man spends half his working hours under artificial light, and, as this is often a very small fraction of natural daylight, it is not surprising that defective eyesight is so widespread. Present-day lighting levels are governed by false impressions of economy and these curtail the lighting requirement necessary for correct seeing and eyesight preservation.

THE E.L.M.A. LIGHTING SERVICE BUREAU IS MAINTAINED BY THE MANUFACTURERS OF THE FOLLOWING BRANDS OF BRITISH-MADE LAMPS:

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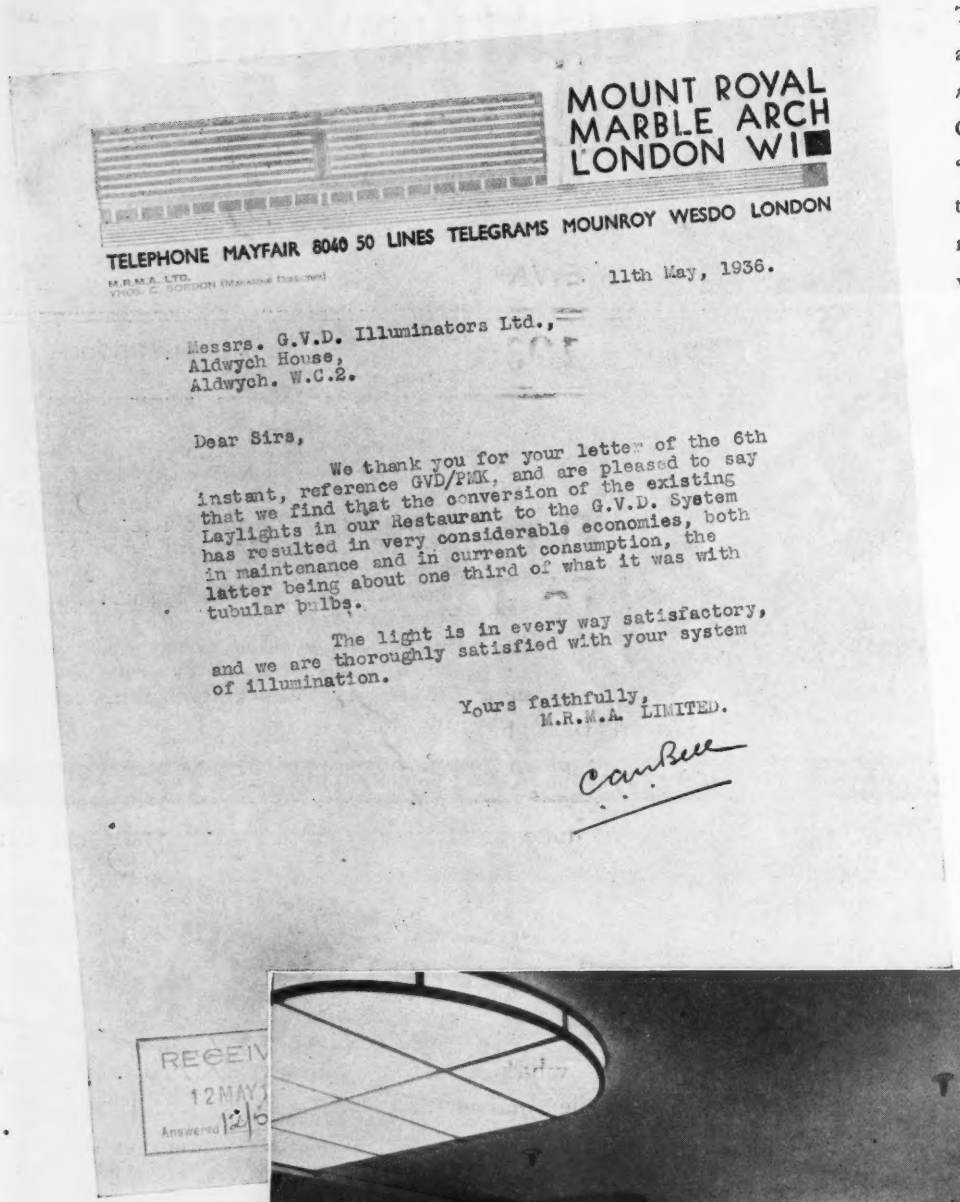
•After nearly a year ....



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THOS. C. GORDON (Managing Director)

11th May, 1936.

Messrs. G.V.D. Illuminators Ltd.,
Aldwych House,
Aldwych. W.C.2.

Dear Sirs,

We thank you for your letter of the 6th instant, reference GVD/PMK, and are pleased to say that we find that the conversion of the existing Laylights in our Restaurant to the G.V.D. System has resulted in very considerable economies, both in maintenance and in current consumption, the latter being about one third of what it was with tubular bulbs.

The light is in every way satisfactory, and we are thoroughly satisfied with your system of illumination.

Yours faithfully,
M.R.M.A. LIMITED.

RECEIV
12MAY
Answered 12/5

This letter is interesting as an indication of the *maintained* efficiency of G.V.D. lighting.

"Mount Royal" formed the subject of an announcement last year, when detailed particulars were given of the remarkable improvements and economies resulting from the substitution of G.V.D. lighting for that originally installed in the Dining Room.

"Mount Royal," Marble Arch, W.

Architects: Sir John Burnet, Tait & Lorne.

May we co-operate with you on your next lighting scheme? Suggestions gladly submitted on receipt of plans.

G. V. D.
ILLUMINATORS
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ALDWYCH HOUSE
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Incorporating "The Illuminating Engineer."

Light and Lighting

Official Journal of the Illuminating Engineering Society.

32, Victoria St., London, S.W.1.

Edited by J. STEWART DOW

Telephone: Victoria 5215

Vol. XXIX.—No. 7 July, 1936 PRICE NINEPENCE Subscription 10/6 per annum, post free

Principal Contents:

They That Go Down To The Sea in Ships—

IN the Queen Mary all the latest refinements in lighting have been introduced. The illustrated description in our last number and the further data in our present one *(see pp.* 207-209) serve to show what can be done in a vessel of this size, which has been likened to a floating city.

On most of the large passenger vessels recently launched conditions as good, or almost as good, may be found.

But what of others—not only ships-of-war but the mercantile marine—of the relatively small ships that ply the seas for trade? Has everything possible been done for the safety and comfort of workers as well as passengers at sea?

We doubt it. It is only slowly that long familiar progress in lighting on land has been extended to ships, especially those of the humbler class. Yet for men cut off from the land for long periods, artificial light may make all the difference to their comfort in leisure hours and their security when at work on deck or in the hold; in times of emergency, even to the safety of the ship itself.

Public Lighting in Sheffield—Are Headlights Necessary?—The Growth of Traffic Signs—Photography by Polarised Light—Rural Highway Lighting—How the Eye is Deceived—Lighting of Leeds Town Hall.

Public Lighting in Sheffield

The annual report of the public lighting engineer in Sheffield, Mr. J. F. Colquhoun, is always an outstanding one. Year by year the value of the tabular data and graphs at the end of the report becomes more evident. They present a complete picture and reveal substantial achievement during Mr. Colquhoun's period of office. It is remarkable that the actual net expenditure on public lighting last year was almost identical with that in 1925—although the candle-power provided, which is now approaching the 3,000,000 mark, has been more than doubled, and the cost per candle per annum practically halved (it now stands at 4¾d.). During the past year efforts have been made to bring the lighting of the chief traffic routes into line with the M.O.T. Committee's recommendations. The number of gas lamps remains almost the same. Electric lamps have increased somewhat. The 100-watt filament lamp is much the most widely-used electric lamp. So far, Sheffield seems to have contented itself with a "nibble" at discharge lamps, only fourteen (ten sodium and four mercury vapour) being in use. Roughly, 596 miles of streets are lighted at an average cost of £96.6 per mile per annum, and there are now ninety-two illuminated guard posts in use on safety islands. Results of some instructive life-tests of both electric lamps and gas mantles are quoted. Artificial silk seems to have proved the best material for mantles, an average life in the neighbourhood of 3,000 hours being recorded.

Are Headlights Necessary?

A generously planned Class "F" specification was recommended by the M.O.T. Committee as an indication of what is necessary on traffic routes in order to enable drivers to proceed with safety at 30 m.p.h. Are headlights needed under such conditions? In the report quoted above some statistics are given. In streets with a minimum illumination of 0.06 ft.-c. (complying with the M.O.T. suggestion), 58.8 per cent. drivers used no headlights, 34.1 per cent dipped them, and 7.1 per cent. used full headlights. On a more brightly-lighted road, with a minimum of 0.23 ft.-c., the corresponding figures were 73 per cent., 18.5 per cent., and 8.5 per cent. There can, we think, be no question nowadays that headlights *are* both unnecessary and inexpedient on well-lighted thoroughfares. They have the drawback of dazzling approaching drivers and pedestrians, and their beams, by diminishing the contrast between objects and the bright road surface, may actually defeat the aim of the street lighting.

The Growth of Traffic Lights

The Motoring Correspondent of the "Evening News" comments on the rapid extension of the familiar red, green, and amber traffic lights throughout Great Britain. He estimates that quite 1,500 crossings are now controlled by such lights, of which about four-fifths are of the vehicle-actuated type. In the London area alone there are stated to be 583 light-controlled crossings. The first cost of a modern vehicle-actuated system at four crossroads is of the order of £800, and the total maintenance cost not more than £75 per year per crossing. As the cost of providing a crossing with control by policemen is estimated at £500 per annum, the light control system should pay for itself within two years. It may seem odd to recall now how gravely the successful application of such methods to the more irregular and winding roads of British cities—as compared with the straight and formal layout in American cities—was doubted, and how cautiously the initial experiments were made. But one can hardly doubt that this caution has had good results, for much has been learned in regard to the best means of applying the system to British ideas—though we are not going to pretend, even now, that the results are always ideal from the standpoint of the pedestrian, especially where more than four roads converge!

Photography by Polarised Light

It is a familiar fact that much of the light that reaches our eyes is polarised. This applies, for example, to the blue sky and to light reflected off the sea or, indeed, any polished surface. Use has occasionally been made of this fact—for example, in some nautical instruments fitted with nicols, which could be set to prevent the entrance of polarised reflected light from the sea and thus relieve the eye of glare. But the inconvenient nature of nicols and tourmalines has always limited the application of this principle. Only recently has it been found possible to produce an optical screen, stated to consist of countless minute rod-like crystals, which can be produced in relatively thin films and sheets, and yet has all the desired qualities of an analyser. The applications of such screens, developed in the Eastman Kodak Company Research Laboratories, are described in an article by Mr. J. W. McFarlane in the "Photographic Journal." These "Pola" screens can be placed in front of a camera and adjusted to eliminate a great deal of troublesome reflected light. They are thus specially helpful in getting better definition or producing enhanced contrast in the case of glossy materials or in graduating the brightness of the sky background.

Rural Highway Lighting

An instructive contribution to the "Transactions of the American Illuminating Engineering Society (U.S.A.)" (May, 1936), by Mr. Arthur J. Sweet, a well-known American expert on street lighting, points out the fundamental difference between urban and rural conditions. In urban street lighting, he remarks, we wish not only to detect the presence of objects but to recognise their nature; we wish to recognise acquaintances, to judge whether the stranger appears inoffensive or a suspicious character, to consult a watch, to read street names, etc. Objects must, therefore, be well illuminated. In rural highway lighting, however, the main consideration is to discern the presence of an object, and to avoid collision. The problem is to provide a bright road surface, not to light objects on the highway. Objects are best revealed in silhouette. From this standpoint the motor car headlight is an indifferent device, compared with adequate surface lighting. A series of photographs shows that headlights, whilst no better for revealing objects at short distances (100 ft.) than the street lighting, quite fail to reveal objects on the roadway at greater distances, 200 ft. and upwards. Indeed, when used in conjunction with permanent highway lighting, the small illumination they yield may be a positive drawback by reducing the contrast between the object and its brighter background. Mr. Sweet terminated his paper by some useful hints, as follows: (1) On straight stretches of highways lamps must be mounted directly over each lane of traffic; but on curved stretches lamps must be mounted *outside* the curve; on straight highways the best mounting height is 35 ft., but on a very tortuous route 25 ft. may be best; lamps should not be spaced farther apart than approximately eight times the mounting height. Ideal polar curves for various heights of suspension are presented in the original paper.

The Influence of Light on Corrosion

The fact that ultra-violet radiation, by stimulating chemical changes, tends to accentuate corrosion, is now established. Its action on pigments—for example, the colours of paintings in museums—presents quite a serious problem. During the Great War a number of examples of deterioration of materials used in the open, such as rubber, small brass objects, and certain parts of aeroplanes, were found to be related to this effect. Where electrolytic corrosion is liable to take place, this influence of light may be of some complexity, and is affected by the valency of the metals involved. An instructive paper discussing its effect on corrosion phenomena in mild steel was read by Messrs. C. O. Bannister and R. Rigby at the recent annual gathering of the Iron and Steel Institute.

The Lighting of the Coming Paris Exhibition

At a recent meeting of the Société de l'Eclairage in Paris, some particulars of the lighting of the exhibition to be held in that city next year were given. Diffused lighting effects and harmonious displays of colour will be features, and apparently "water lighting" is to be developed in several novel ways, full use being made of the surface of the Seine, for which purpose a special fleet of boats is being prepared. An interesting announcement is that the whole of the lighting is to be supervised by a committee of architects, who will be given full power to impose discipline and prevent the clashing of individual light-effects.

How the Eye is Deceived

Courtesy] [*Bovril, Ltd.*

CAN THE EYE ALWAYS JUDGE ACCURATELY?
Test with a ruler your eyes' estimate of the relative size of these bulls.

The above picture was presented by Mr. Dean Chandler and Mr. A. J. Prestage in the course of a paper read at the last A.P.L.E. Congress in London. It illustrates how readily the eye may be deceived in regard to the apparent size of objects. Such ocular illusions may play an appreciable part in influencing impressions of artificially lighted interiors.

I.E.S. Convention (U.S.A.)

After a period of 24 years, the Annual Convention of the Illuminating Engineering Society (U.S.A.) is being held once more in Buffalo, in the vicinity of the Niagara Falls. The Conference will take place from August 31 to Sept. 3, and the 12th Annual Lighting Service Conference will be held on the opening day (Monday, August 31.)

The Lighting of the Town Hall, Leeds

Imposing fittings in solid bronze, weighing about 10 cwt. each, in keeping with the style of this fine hall, were adopted, and serve to reveal the features of its interesting ceiling.

A view of the Town Hall of Leeds showing the dignified and effective fittings recently installed.

The Town Hall of Leeds is one of the most noble and imposing structures of its kind in the country, built on Classical lines.

It was opened by Her Majesty Queen Victoria, on September 7, 1858.

The building occupies a site area of 6,257 sq. yd., and the main hall of the building is known as the Victoria Hall. It is used of large political meetings and civic functions, and is the venue for the famous Leeds Musical Festival. Its dimensions are 161 ft. long, 72 ft. wide, and 75 ft. high, while it has a seating capacity of approximately 2,000 people.

It was recently decorated in a scheme of ivory and gold, with scarlet bases to the massive side pillars. The furnishings are in scarlet.

This lofty hall has a wonderful ceiling which, in the past, was never apparent to the occupants of the hall because of the indifferent lighting and the enormous height. After re-decoration it was felt that an improved equipment of lighting fixtures was essential to do justice to the structure.

It was wisely decided that a building so rich in the classical style could not be made the scene of experiment with fixtures of an ultra-modern nature, but, at the same time, characteristics of modern equipment were embodied in a design of lighting fixture which follows closely the period nature and decoration of the original architectural scheme.

In the ultimate, there has been erected seven main lighting units of solid bronze which carry out, virtually, the lighting of the whole hall, being supplemented by nine smaller fixtures, of a similar style, under the gallery.

The vertical and horizontal metal sections of the fixtures carry chased-work identical in type to what appears on the walls, cornices, etc., and the arrangements of spheres round the upper rim of the main fixtures has not only softened the severity of the design but has afforded a measure of subdued flood-lighting, in an upward direction, which has shown to the citizens for the first time what a wonderful ceiling the Victoria Hall really carries.

The suspension of the fixtures was given great consideration. As these fixtures are some 34 ft. long and weigh with their retaining gear some 10 cwt. each, it was decided that the complete fixture must be designed and made so that every strain was carried by duplicate members. Every internal strut and cross member is in duplicate; 2 1-piece solid steel tubes, concentric to one another, form the main suspension. They are shrouded externally with a bronze tube, and although the raising and lowering is carried out by safety winches of the worm gear type, no weight is carried by the steel ropes after the fixtures reach the ceiling. At that point massive steel clamps close round the central steel tubes, and steel girders support the weight. There is approximately 3-kwt. of light in each fixture.

The hand-bent glass panels are of heavy section sprayed golden amber. The bronze metal-work is heavily lacquered to the finish of old gold, so that by day or night these lighting units are a long overdue enrichment to the hall.

An important result that has been achieved is the absence of glare, particularly as affects the occupants of the gallery. Much distraction was previously caused, during classical concerts, by downward glare. This defect has been entirely removed and a restful atmosphere has been achieved. In this connection it is to be noted that the support given to the classical concerts, since the new lighting has been provided, has been much greater than in previous years, and there is little doubt that the improvement in atmosphere and absence of glare has had much to do with it. It will suffice, perhaps, to say that there has not been a single word of adverse criticism received from any patron of the concerts.

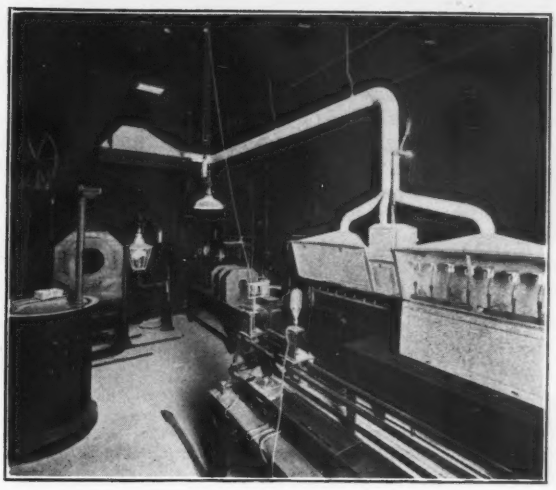
There is a large lofty vestibule in the classical style, and the wonderful effect in the Victoria Hall has been so much admired that it has just been decided to put an almost similar lighting fixture in the vestibule, and this, undoubtedly, will make both the approach and the Victoria Hall a much more attractive combination than ever it has been before. The famous organ, insured for £30,000, one of the few five manual organs in the country, has now appeared to the citizens in a new light. The amount of horizontal lighting, introduced by the design of the fixtures, has achieved this effect.

All the above information has been given us by the Sun Electrical Company, Ltd., who designed and supplied the complete installation.

CITY OF MANCHESTER GAS DEPARTMENT

Street Lighting Section

A description of the Street Lighting in Manchester, and of the work of the Gaythorn Photometrical Laboratory.

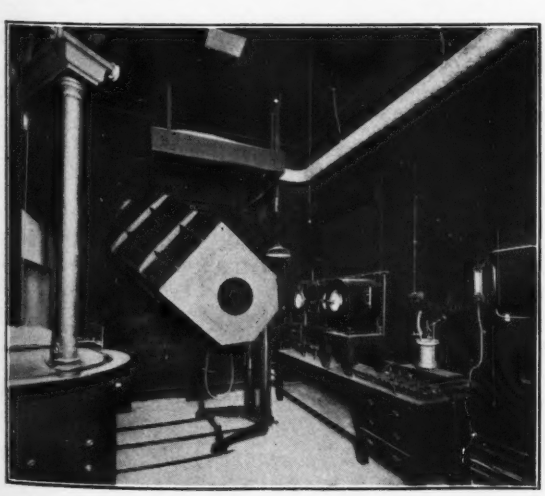


A view of the Photometric Laboratory showing street lantern in position for testing.

On March 26, members of the North-Western Area (Local Section) of the I.E.S. visited the Gaythorn Photometrical Laboratory of the Manchester Corporation Gas Department, at the invitation of the Gas Committee. After being entertained to tea with the Chairman of the Committee, Councillor F. Jackson, and the Chief Engineer, Mr. A. L. Holton, presiding, members inspected the laboratory, where a number of interesting examples of gas street-lighting apparatus were shown, the equipment being demonstrated by Mr. Crawford Sugg.

This laboratory was installed on the recommendation of the Chief Engineer, to whose specification it was equipped. The apparatus in the laboratory is of the type described by Messrs. R. McGibbon and P. C. Sugg in a paper read before the I.E.S., a summary of which appeared in our June issue. There is no need therefore to give any detailed description of the apparatus, but the following interesting points were explained to members during their visit.

Photometric Apparatus.—In the design of the photometer, allowance had to be made for various factors, one in particular being the general use of reflectors and refractors, which have had the effect of increasing the effective size of the light source. This fact gives rise to two sources of error which must be guarded against. Firstly, the inverse square law upon which photometric measurements depend is exactly applicable only to a point source, but experiments have shown that the error due to this cause is negligible if the distance from the source to the photometer head is at least eight times the width of the source. Secondly, when reflectors are used which are non-axial, the ray from these reflectors may give the maximum candle power on a photometer head only a short distance away at a given angle, yet in actual use, at a distance of 50 feet or more from the lamp the ray may be found to be as much as 15° from the indicated position. For both these reasons, therefore, it is necessary that the distance from the light source to the photometer head should be as great as is practicably possible. The room is use measures 30 ft. by 12 ft. by 14 ft. high, the windows being fitted with dark blinds and the walls, ceiling, floor and all furniture and apparatus being painted matt black.



Another view of the Laboratory showing Mirror Head rotated.

The photometer apparatus consists of a lamp mounting and photometer bench with a mirror head interposed which receives light at any angle from a test lamp and directs it axially into the photometer head, where its intensity is compared with that of an electric standard lamp. Mountings are provided for either suspension or upright fixing lamps. A canopy, connected to an exhaust fan, is fixed over the test lamp position in order to avoid vitiation of the air and to stimulate open-air conditions when testing large-consumption outdoor type lamps.

Mirror Head.—This is designed to accommodate lighting fittings up to 33 in. diameter. There are three mirrors all arranged at 45° to the main axis of the instrument, which passes through the trunnion about which they swing. The whole mirror head is mounted on three rails and can be moved to one side during erection of test lamps.

Portable Photometers.—For street tests a Holophane-Edgcumbe Auto-Photometer using a photo-electric cell is employed. A Rektolux photo-electric cell type of photometer is used for routine tests of the high-pressure street lamps, and a Holophane Lumeter is also available. Arrangements are made for checking these against the laboratory standard.

Street Lighting.—The photometrical laboratory has been specially equipped to solve problems in connection with street lighting. The street lighting under the control of the Manchester Gas Department is very extensive, consisting of 20,245 low-pressure lamps ranging from 2-light to 10-light, while the high-pressure system is by far the largest in the provinces, consisting of 902 lamps, which are mainly 1,000 and 1,500 candle-power units.

The lighting of the streets in Manchester is under the control of a sub-committee of the Highways Committee and their chief official—the City Engineer. This committee has appointed a Lighting Superintendent, who is quite independent both of the Gas and Electricity Departments, and he advises the Highways Committee on all matters pertaining to street lighting. The Gas and Electricity Departments each control their respective organisations, alterations and additions being made on the instructions of the Highways Committee. This arrangement has been found to work very smoothly in practice.

At the present time the low-pressure system is being converted from manual control to automatic clock controllers. An extensive test is being made of the electro-catalytic ignition type of controller, and also of the Horstmann "Comet" igniter device. Fog by-pass taps are fitted to all controllers.

As districts are converted to automatic control the opportunity is taken of modernising the existing lighting, this being in addition to other similar work throughout the city. The principal improvements are:—

(1) Replacement of out-of-date lamps.

(2) Increased mounting heights to comply with the B.S.I. specification.

(3) The fitting of auxiliaries to obtain an improved distribution of light.

Experiments are being carried out with many types of reflectors and refractors. The following are the types usually fixed:—

Old square lanterns.—Directional reflectors under the mantles.

New square lanterns.—Top feed burners and a top reflector, and two wing reflectors of "Staybrite" steel.

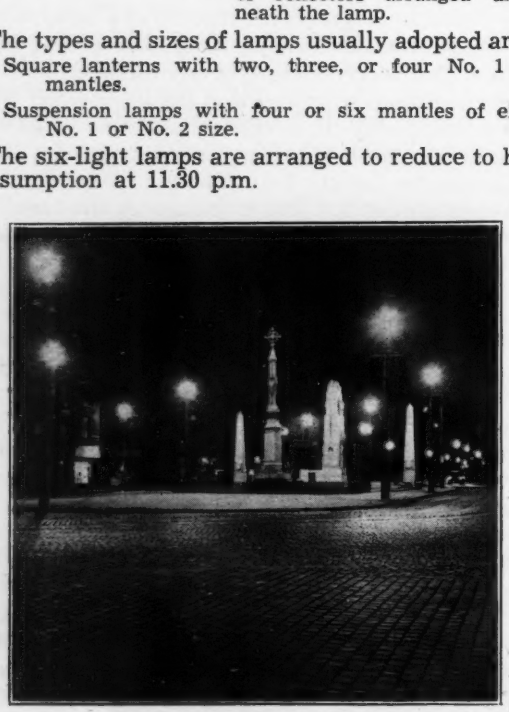
Suspension lamps.—Directional wings behind the lamp or reflectors arranged underneath the lamp.

The types and sizes of lamps usually adopted are:—

Square lanterns with two, three, or four No. 1 size mantles.

Suspension lamps with four or six mantles of either No. 1 or No. 2 size.

The six-light lamps are arranged to reduce to half-consumption at 11.30 p.m.



Class "A" Lighting in St. Peter's Square, Manchester.

Floodlight Lamps at the Manchester Art Gallery.

Illumination Tests.—To ensure efficiency, the lamps are regularly inspected and illumination tests are carried out on three nights every week on both high and low pressure systems. The whole of the high pressure system is covered in cycles of three weeks, and such tests are additional to the routine inspections by the foremen, and periodical inspections by the district surveyors. Any defective lamps found on these inspections are reported for immediate attention. That efficiency is maintained is shown by the following:

(a) One lamp tested regularly two or three times a week over a period of nearly two years gave an average candle power at 71½ deg. from the vertical of 84.7 per cent. of the laboratory maximum.

(b) Five lamps tested regularly once every two or three weeks over a period of three years gave an average candle power at 71½ deg. from the vertical of 81.4 per cent. of the laboratory maximum.

(c) Six lamps tested regularly once every two or three weeks over a period of three years gave an average candle power at 71½ deg. from the vertical of 83.3 per cent. of the laboratory maximum.

Every night after completing lighting or inspection, the lamplighters must enter on report sheets all defective lamps or low lights found on their rounds. Copies of these reports are sent to the office and to the maintenance department for attention on the following day. All clock-controlled lamps are inspected after lighting time every night. Except for unavoidable reasons no lamps must be left out or with only a very poor light.

There is an installation of class "A" lighting in St. Peter's-square, where there are twelve 4,500 candle-power high-pressure lamps mounted on tramway poles at a height of approximately 30 ft. Each lamp has three 1,500 candle-power mantles, two of them being extinguished at 11.30 p.m. The lamps are lighted and extinguished by hand, but the reduction at 11.30 p.m. is by clock controllers, which are of the ordinary low-pressure type in a weatherproof case.

Experimental work in the streets on new installations and new types of lamps is a matter of arrangement with the lighting superintendent, and particulars of a few test installations are as follows:

(a) Three high-pressure "Supervia" lamps.

Average test point illumination	0.160 ft.-candles.
Average spacing	118 ft.
Width of carriageway	46 ft.
Mounting height	21 ft.
Gas consumption per lamp ...	24 cu. ft. per hr.

Floodlighting at the Garden of Remembrance.

(b) Thirty-one "Kompar" lamps (low pressure), each with eight No. 1 mantles.

Average test point illumination	0.075 ft.-candles.
Average spacing	117 ft.
Width of carriageway	27 ft.
Mounting height	15 ft.
Gas consumption per lamp ...	14 cu. ft. per hr.

(c) Six Sugg "Rochester" six-light suspension lamps with dish refractors.

Average test point illumination	0.092 ft.-candles.
Average spacing	105 ft.
Width of carriageway	35 ft.
Mounting height	18 ft.
Gas consumption per lamp ...	15½ cu. ft. per hr.

(d) Six low-pressure "Supervia" lamps.

Average test point illumination	0.021 ft.-candles.
Average spacing	112 ft.
Width of carriageway	24 ft.
Mounting height	17 ft.
Gas consumption per lamp ...	6½ cu. ft. per hr.

These tests were all made under service conditions. Gas consumptions are for gas with a calorific value of 450 B.Th.U. per cubic foot.

Traffic Signs.—As traffic problems daily become more complex with increasing regulations, it is very necessary that traffic signs should be well and reliably illuminated. In Manchester there are two types of gas-illuminated traffic signs:

(1) "Day-Night" box type reflector signs illuminated at night by a four-light No. 1 suspension lamp arranged over the top of the sign.

(2) Internally illuminated type, with two No. 2 mantles. The top of the sign is of clear glass to illuminate a red disc, or ring, over the top of the sign. A heat-resisting glass is used which will withstand being heated and then deluged with cold water. A clock controller is arranged inside the sign.

Two types of illuminated bollard are in use:

(1) Lighted by two No. 1 mantles. The surface of the bollard is well illuminated and in addition the lantern portion at the top is glazed with opal glass, thus showing a direct light. "Keep Left" or other signs can, of course, be substituted for the opal glass.

(2) Lighted by one No. 2 mantle. The bollard is very well illuminated, but there is no light showing at the top, so that should any traffic instruction be required it must be separately illuminated.

Floodlighting the Cenotaph.—Amongst the lamps arranged for inspection is a high-pressure gas projector type floodlight lamp, which has been specially developed for the floodlighting of the Manchester Cenotaph.

This scheme presented many difficulties, since the Cenotaph is situated in the centre of St. Peter's-square, which has Class "A" illumination. Further, the lamps could be fixed only on tramway standards, which are forty to fifty feet away from the Cenotaph. It was, therefore, necessary to use a lamp of the projector type, and four such lamps were obtained for experimental purposes. The lamps were for low-pressure gas and were fitted with three No. 2 size mantles, with a parabolic reflector, and on being tested were found to give a maximum candle-power of 2,700. This was quite inadequate for the purpose, and no great improvement was obtained by fitting even a 5-light burner. The difficulty was that the light source was too big to come within the focal point of a parabolic reflector. It was decided to convert the lamps to high pressure, and to fit a single 350 candle-power mantle in each lamp. From this a maximum candle-power of 6,000 was obtained, which was later increased to 8,000 candle-power. Messrs. James Keith and Blackman Co., Ltd., were made conversant with the experimental work, and they agreed to make up a projector type lamp for high-pressure gas. A sample lamp was submitted and, after several modifications had been made, the whole scheme was carried out and was put into operation in time for Armistice Day, 1935.

The lamps are of unique design, the following being a brief description:—

The mantle is 350 candle-power in size, burnt off and collodionised type, and is of a short and stubby shape, fixed horizontally. It is arranged at the focal point of a 15-in. diameter chromium-plated parabolic reflector. The mantle is enclosed in a silica cup, which is held in position by a spring clip. The waste gases are extracted at the back of the lamp, and they pass round the outside of the burner tube to

Manchester Cenotaph Floodlighted.

Gas illuminated bollards in Manchester by day and night.

provide superheating. There is no secondary air supply, all the air for combustion being taken in at the primary air inlet. The lamp is lighted by a flashing by-pass, which is ignited by a special electro-catalytic igniter adapted from a Horstmann "Comet" igniter. Advantages of the lamp are that the waste gases do not come into contact with the chromium-plated reflector, and no opening is necessary above the mantle for the extraction of the waste gases.

The lamps were arranged to work without any cover glass over the front of the reflector, but in practice it has been found that the reflector, when open to the atmosphere, tarnishes very quickly, necessitating very frequent cleaning, and causing a big loss in light output. Experiments have shown that a cover of heat-resisting glass over the front of the reflector obviates this trouble. The number of mantles used is rather high, probably due to the horizontal position and also to the very considerable amount of vibration to which the lamps are subjected, since they are mounted on tramway standards at a very busy corner.

Various experiments were carried out with refractor plates, louvres, and spill shields, to obtain a rectangular beam to suit the shape of the Cenotaph. Although it was found quite possible to accomplish this, all the devices involved some loss of light, and it was eventually decided to have a beam to suit the width, using several lamps to cover the height of the Cenotaph.

The complete scheme consists of ten high-pressure gas projector-type floodlights, and one 10-light low-pressure suspension lamp with "Scoop" reflector, used to illuminate one side, which cannot be adequately dealt with by the projector lamps. The average illumination on the surface of the Cenotaph has been increased from 2.0 foot-candles to 6.4 foot-candles.

Old Cromptonians Annual Dinner

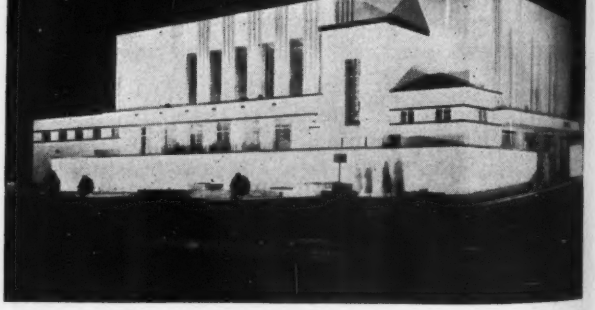
At the Annual Dinner of the Association of "Old Cromptonians" on May 22 over 100 members attended. Col. Crompton, who has recently entered upon his 92nd year, was in the chair, and spoke with all his customary vigour. His health was proposed by Sir Charles H. Brassey. Amongst other speakers was Sir James Swinburne, like Col. Crompton a famous pioneer in electric lighting.

Obituary

W. T. E. Blunden.

We record with regret the death, at the age of 44, of Mr. W. T. E. Blunden, General Sales Manager of Philips Lamps Ltd. Since the war, when he served in the Royal Air Force, Mr. Blunden was associated with the lamp industry. His cheerful disposition and sincerity of purpose gained him many friends in the trade.

Floodlighting with Gas



We are indebted to the "Gas World" for the accompanying illustration of the Cragburn Pavilion, Gourock. This was furnished by Mr. David V. Reid the engineer and manager of the Gourock Gas Department, by whom the pavilion is floodlighted at night.

More Lighting on the Queen Mary

(We are indebted for the following additional descriptive data and pleasing pictures of the Queen Mary, to the British Thomson-Houston Company, Ltd., by whom the various lighting units described and illustrated were designed. A feature of special interest is the coloured lighting in the verandah grill controlled in sympathy with the music.

The lighting of the Verandah Grill—the most exclusive Dining Room on the Liner.

The lighting of the Main Hall. The central fitting is the largest individual unit in the whole ship.

NOTHING quite like the Queen Mary has ever happened before. This affords a reason—if one is necessary—for returning to the subject and giving some further data on the lighting of the vessel, which presents many novel features. In the main the solution of the problems here discussed has been effected by the use of cornice lighting for general utility illumination, with lay lighting and illuminated panels incorporated as architectural features, and special ceiling and bracket fittings for decorative effect. Except in the case of a few special public rooms, low head room and other considerations precluded the use of suspension fittings.

The Entrance Vestibule.

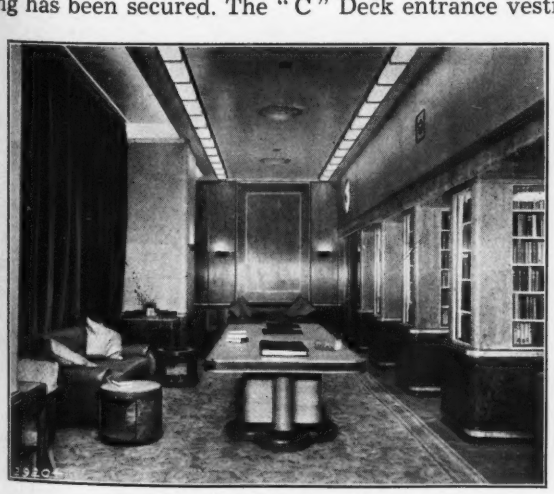
First impressions are always important. Accordingly, special care has been paid to creating a bright and cheerful atmosphere from the moment passengers step on board. The main entrance for the cabin class is on "C" Deck. The gangway leads into the entrance vestibule, athwart the ship, with lifts and main staircase giving access to the decks above.

Over the whole of the main circulating area a measure of uniformity in the character of the lighting has been secured. The "C" Deck entrance vestibule receives its main illumination from four runs of indirect cornice lighting built into the ceiling, each run accommodating sixty 15-watt pearl lamps spaced at 6in. intervals. The visible light sources, however, are five 3 ft. diameter moulded glass ceiling fittings, four special ceiling mounted units in each of the embarkation lobbies to port and starboard of the main staircase, and some eleven 3 ft. long moulded glass trough fittings in the subsidiary areas. Decorative glass panel doors give access from the vestibule to the main staircase, opposite which are the revolving glass doors leading to the first-class swimming pool. Above this entrance is a moulded glass decorative treatment, semi-circular in shape, with an area of some 22 sq. ft., illuminated by thirty-three 15-watt lamps.

The Main Staircase.

This communicates from "C" Deck through "B" and "A" and Main Decks to the Promenade Deck level, whence it opens into the main hall and shopping centre, with access therefrom to the principal public rooms.

On this impressive and brightly lighted staircase the general illumination is provided by moulded decorative bent panel fittings, shaped to follow the



The Cabin Class Library; lighting provided by luminous beams and indirect wall fittings.

The Cabin Class Main Entrance Vestibule—"C" Deck.

The Aft Private Dining Saloons. Notice the spun bowl indirect central fitting, and the lighting behind the dummy windows.

curved soffit lines of the ceiling. At the ceiling termination at the topmost deck a modified design of unit was necessary, but the same general character was retained. This stairway lighting is essentially architectural in style, serving both utility and decorative requirements. On each of the half-way landings a fluted glass vertical fitting employing a 20 in. architectural lamp, a jardiniere fitting, and a moulded glass pilot lighting the ceiling at the deck entrances add decorative lighting effect, and at the same time provide the necessary safeguard against failure of the main lighting service in emergency. Illuminated indicators, set in the stair risers, mark the different deck levels.

The Main Hall and Shopping Centre.

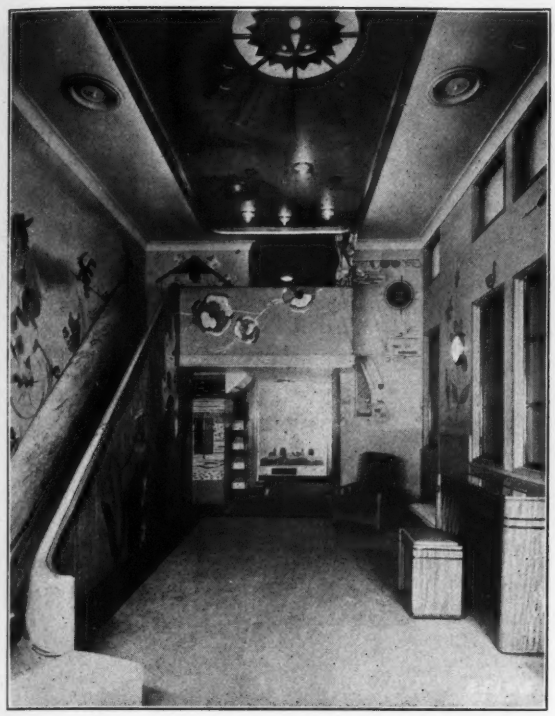
Emerging from the staircase at the promenade deck level, the main hall is entered. Here the lighting reaches the climax. The central feature is a magnificent ceiling fitting specially created by the B.T.-H. Company. It is built in three tiers of heavy decorative moulded glass and silver bronze metal. This fitting, 5 ft. in diameter, accommodates forty-four 40-watt pearl lamps, and weighs nearly half a ton. It is the largest individual fitting in the whole ship, and its design sets the style for the smaller ceiling units, pilot light, and trough type fittings employed throughout the main circulating area. There are four fittings of similar character, 3 ft. in diameter, and taking twelve 40-watt lamps each, on either side of the entrances to the side rooms, and thirty-two 17 in. diameter fittings, harmoniously designed in moulded decorative glass, in each of which there is a 200-watt lamp. Further illumination is provided by no less than 262 ft. of indirect cornice lighting built into the ceiling, and equipped with 524 15-watt pearl lamps. The combined effect of all these light sources is one of uniform brilliance, in which the shop windows and showcases, and sundry decorative features, provide highlights of still greater intensities. For the illumination of the displays, 165 shop window reflectors have been installed, using lamps of 60 to 100 watts. Notable among the architectural decoration of the main hall are jardinieres—semi-circular recesses in which flowers, statues, and other ornaments are placed. These objects are floodlit from above by specially designed concealed spotlights, in such a way that they stand entrancingly revealed from their surroundings in a shaft of light.

Harmonising Light and Sound.

The verandah grill provides what is possibly the most striking novelty in illumination, i.e., the automatic harmonising of symphonies in coloured light with the sound symphonies of the music played by the dance orchestra. The dimming and changing of coloured lights in sympathy with music is not, of course, new in principle. But here the tonal qualities of the music have been applied to actuate and control the light changes by an ingenious application of the Thyratron. The band music is picked up by concealed microphones, amplified and filtered into high, medium, and low frequencies of the appropriate intensities. The filtered outputs are applied to the control circuits of three Thyratrons, each of which regulates one of three sets of coloured lights—red, blue, and green. Through the medium of special reactor dimmers the voltages in the respective circuits are increased or reduced, so varying the light intensity of each group of colour lamps. Thus sound and light continuously change in sympathy and harmony. This unique coloured lighting control is provided both in the ballroom proper and in the verandah grill restaurant, the centre section of which is arranged as a dance floor.

The verandah grill is the most exclusive dining room on the ship. It is situated aft on the sun-deck level, with bay windows opening out on to the sports deck. Centrally suspended over the dance floor is a uniquely beautiful fitting, constructed of different coloured plate-glass sections, ½ in. thick, and etched in designs in keeping with the mural decorations. This special fitting, another outstanding B.T.-H. creation, embodies colour-changing effects, and employs eighteen 15-watt and one 100-watt pearl lamps. In the decorative glass balustrade surrounding the dance floor are 156 15-watt sign-type coloured lamps, in blue, red, and green. The main lighting, which is indirect, is derived from cornices built into the ceiling and accommodating 296 15-watt lamps for white lighting, with 264 15-watt sign-type lamps in blue, red, and green for colour effects. Additional decorative features are provided by illuminated moulded-

Cabin Class Drawing Room illuminated by indirect cornice lighting.



The Cabin Class Children's Playroom. Here lighting units representing the Sun and the Stars, etc., are in evidence.

The lighting of the Cabin Class Lecture Room.

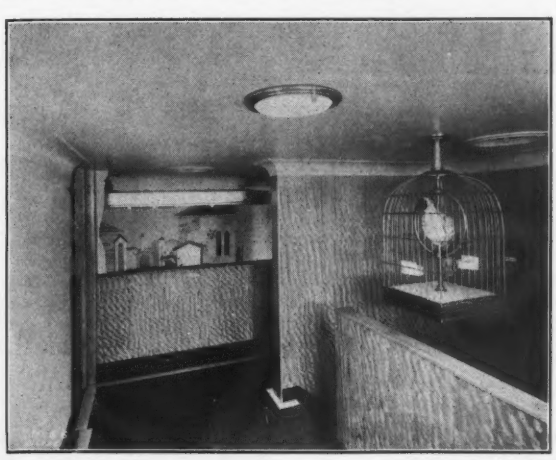
glass fittings around two columns that form part of the interior structure of the ship, employing six 15-watt lamps each; and each dining table has its own central standard in amber-tinted glass. The combined effect of these illuminations, in the surroundings of light silver-leaf decorations, is brilliant and inspiring. With the added novelty of sound synchronised colour-change lighting there can be no other dining room or dance floor in the whole world so admirably and subtly illuminated for the creation of " atmosphere."

Children's Playroom.

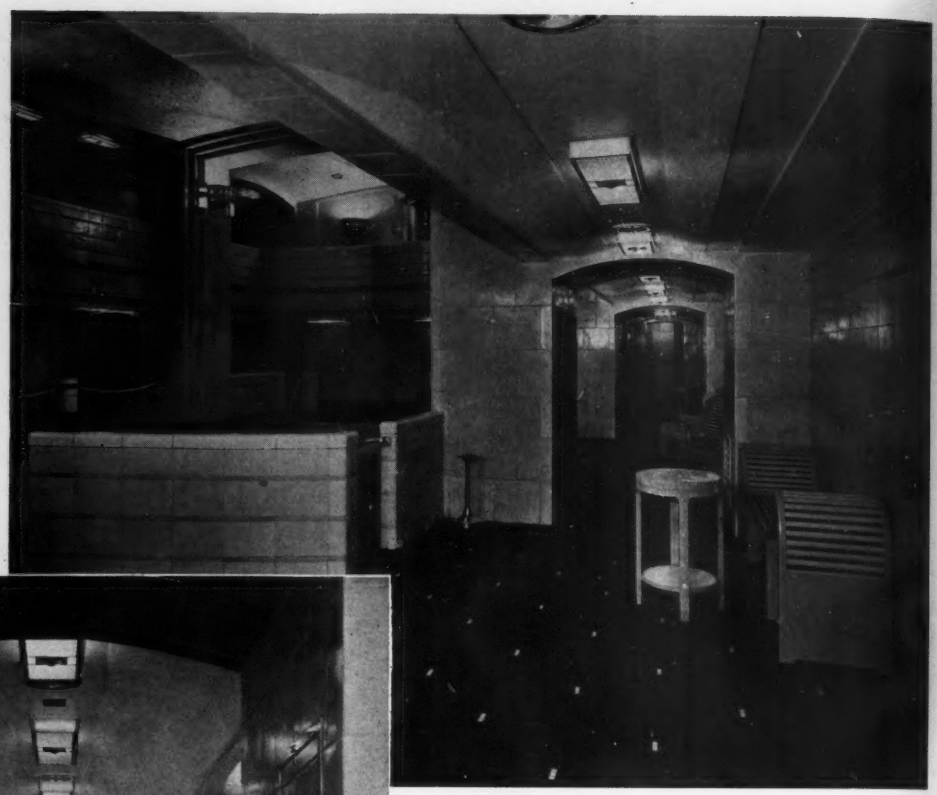
The characteristic of appropriateness, both of decoration and lighting, is well exemplified in the children's playroom. Everything that appeals to child mentality is provided, not as toys but the real thing in miniature—sentry boxes for the young militant, caves for the lawless brigand, curtained-off rooms for the mothers of dolls, with sleeping accommodation for infants who may fill the latter role to the life, and a sliding chute for the delight of one and all. Around the walls are mural decorations and cut-out silhouettes incorporating witches and gnomes, and the animal characters familiar to every modern child. Overhead a smiling sun radiates rays of golden sunshine, and a blue moon floats in a starry heaven, within a periphery of white light from concealed cornices. In the miniature home lights switch on and off, shining through the windows to tell of some domestic happening; in the dark recesses of the caves lamps flash, suggestive of some dark smuggling adventure. Above the steps leading to the sliding chute a lifelike reproduction of a West African parakeet, cunningly reproduced in hand-painted silk, flaunts his multi-coloured, internally illuminated plumage.

In truth it is a wonderful playroom, enriched and made real by light effects. But consideration has also been paid to safety. No bouncing ball or other projectile will ever invoke a shower of glass from the illuminated sky, and in the play recesses the lights can be operated, but not dismembered, to satisfy the inquisitive child who wants to see the works go round. Special precautions to the same end have also been taken in respect of the utility lighting—recessed bulkhead-type wall and ceiling units are employed with their $\frac{1}{2}$ in. thick plate-glass panels. There are, of course, emergency pilot lights here, as everywhere else in the ship.

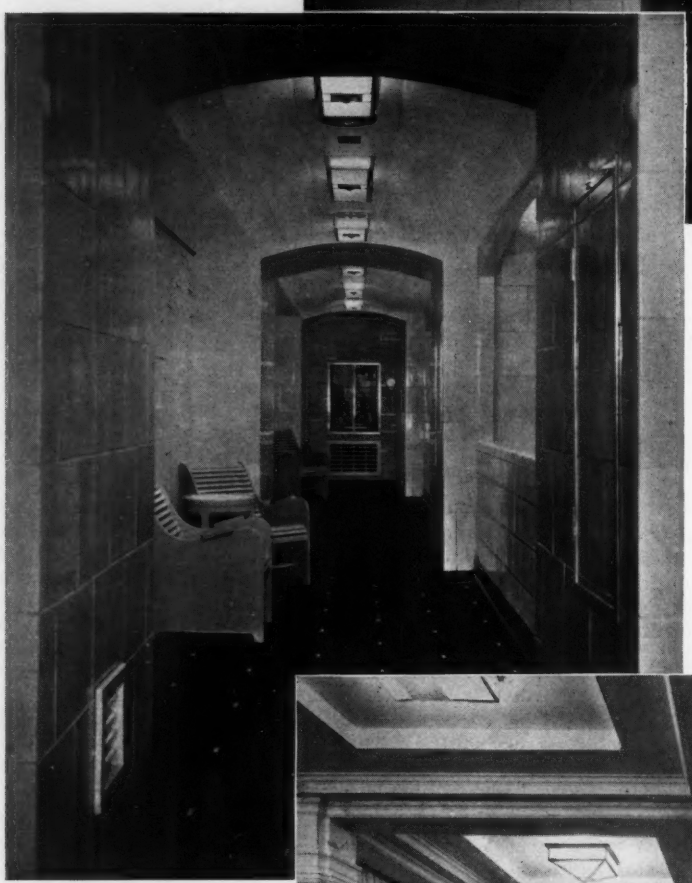
The lighting in the Main Deck—Cabin Class—Main Entrance Vestibule.



The Cabin Class Children's Playroom showing close-up of the B.T-H. Illuminated Parrot Cage fitting, one of the most novel lighting units installed in the Queen Mary.



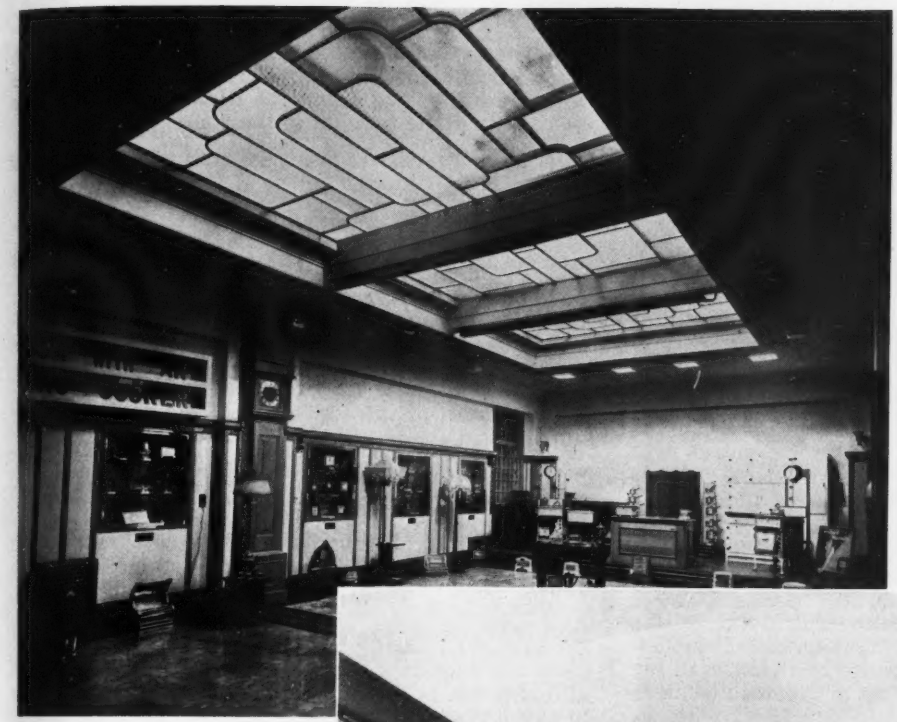
The adjacent picture shows the appearance of the balconies and corridors surrounding the first-class Swimming Pool on the Queen Mary. The lighting is effected by very shallow units, each three feet long and containing a single lamp, which do not restrict headroom. The illumination is ample for the purpose, and all lamps are concealed from view.



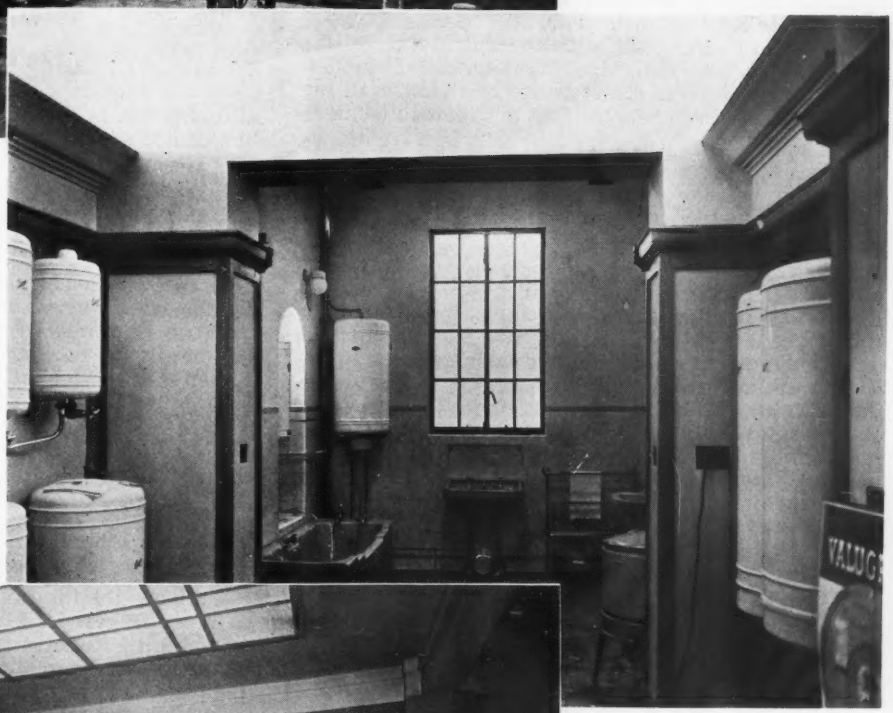
Diffusion of Light

We are indebted for the illustrations on this and the opposite page, all showing highly diffused lighting, to G.V.D. Illuminators Ltd., whose units were installed in each case. A feature of the lighting of the Swimming Pool Corridor of the Queen Mary, seen on the left, is the uniformity of the lighting. A curious and interesting illusion is the impression of height. Actually the ceiling height is only 6 ft. 6 in.

In the case of this interior, the Car Mart Showrooms in Park Lane, diffusion of light, which enables each individual car to be shown to advantage, is again a feature. Such lighting enhances the high finish on the coachwork, in which the images of the lighting units are clearly seen. Each of the ceiling units contains a single 200-watt lamp, and is mounted 15 feet above floor level.



Here is a picture of the Dundee Corporation Electricity Showroom, illuminated by a large laylight 424 sq. ft. in area. In daytime it admits natural light. During the night time it is illuminated by four lamps with an aggregate consumption of 1,600 watts, and gives a very pleasing general effect. It will be noted that all surrounding lights, with the exception of the four spot lights over the platform, were extinguished when this photograph was taken.



Another view of Dundee's new Showrooms. The cornice lighting in the foreground uses two 40-watt lamps on each side, and the artificial window in the background (6 ft. 4 in. x 3 ft. 9 in.) receives light from a single 200-watt lamp.

In this Restaurant in the north of England, the lighting is of a character to create a restful atmosphere. Good features are the absence of glare and the diffusion of light throughout the room—conditions that are now becoming usual in modern restaurants. Judicious lighting in such cases is of great importance, and should be adapted to the local conditions. By the careful selection and placing of lighting equipment one can do much to create the impression of gaiety or restfulness as circumstances demand.

EVERYDAY PHOTOMETRY

(III) Illumination from "Line" and "Surface" Sources

Of course—as was admitted in the first of this series of articles*—every light-source has some magnitude and must therefore be regarded as a surface. It may, nevertheless, be convenient for the moment to adopt popular phraseology and to speak of "line-sources" when we mean tubular architectural lamps and the like and "surface-sources" when we have in mind such sources as illuminated ceilings or canopies with lamps distributed behind panes of diffusing glass, so that the light does in fact come from a relatively extensive area.

It has been seen that in the photometric laboratory, apparent departures from the inverse square law are not usually very serious. This still holds in practice when we are concerned with the calculation of the illumination from individual light-sources at moderate distances, such as street lamps at distances of say 10 to 100 ft. or even searchlights at greater distances.

But in all such cases we can still calculate with ease on the basis of the inverse square law only because the size of the source, even under the worst conditions, is still small compared with the distance of measurement.

Direct and Reflected Light.

Now in practice, and especially under modern conditions of lighting, there are two factors which at once impair the simplicity of our calculations. In the first place we cannot always confine ourselves to direct light. In many cases (as in the streets, or in the dockyards, or railway yards) the illumination may be almost entirely due to direct lighting. But in most interiors "indirect light" (light from the sources which is reflected and scattered by surrounding surfaces such as walls and ceilings) furnishes a useful and sometimes a substantial proportion of the available illumination. Consideration is given to this factor in calculations conducted "on the lumen basis." These will be handled in a subsequent article. For the moment let us assume that we are concerned merely with the calculation of direct illumination, regarding any adventitious gain in reflected light as a windfall to afford a margin and make good depreciation losses (an old fashioned but not at all a bad plan in the case of installations using mainly direct light).

Effect of the Size of Source.

Having made this assumption, however, we quickly come up against a second and more fundamental disturbing factor—that the dimensions of a source may be so big in comparison with the distance at which its illumination is required, that the inverse square law is no longer easy to apply. (This law, be it noted, remains true—the difficulty is due to the fact that the distances of different portions of the light-source from the point of measurement are by no means the same. We are uncertain what value to insert in our formula.) It is with this second problem that we propose to deal in the present article.

In architectural lighting we have frequently to do with installations in which "line-sources" and "surface-sources" are employed. It will be useful, therefore, to consider in turn the illumination received from a luminous line and a luminous disc.

* "Light and Lighting," March, 1936. p. 87.

The Luminous Line.

In the case of a luminous line, subtending an angle θ at a point directly opposite the mid-point of the line, it can be shown that the illumination at such a point on a plane parallel to the source will be:— $\frac{I_\circ}{2r}(\sin\theta + \theta)$, where $I_\circ$ is the normal candlepower per unit length and θ is given in radians.

When the line becomes infinitely long the illumination becomes $\frac{I_\circ}{2r}(\sin\pi + \pi), = \frac{\pi I_\circ}{2r}$, that is to say, as one moves back from the line *the illumination diminishes inversely as the distance* (instead of inversely as the square of the distance, as in the case of a point source).

If, however, r is large compared with l, where l is the length of the source, $\sin\theta$ is approximately equal to θ which is equal to $\frac{l}{r}$. Hence the illumination becomes $\frac{I_\circ}{2r}2\theta = \frac{lI_\circ}{r^2} = \frac{\text{Total normal candlepower,}}{r^2}$ showing that the inverse square law is applicable when the point considered is at a distance from the source large compared with its length.

The Luminous Disc.

In the case of a disc of area A and radius r, the illumination at a point on a parallel plane, opposite the centre of the disc, and distant h from the disc is given by $\frac{\pi Br^2}{r^2+h^2} = \frac{AB}{r^2+h^2} = \pi B \sin\theta$, where B is the brightness of the disc in candles per unit area and θ is the angle subtended at the point by a radius of the disc.

If the disc becomes infinitely great, this formula too becomes a very simple one, for θ becomes $\pi/2$, and the illumination becomes πB — that is to say, as one moves back from an infinite plane, the illumination does not alter but remains constant.

Again if h is large compared with r the illumination $\frac{AB}{h^2} = \frac{\text{Total normal candlepower}}{h^2}$ an expression which conforms with the inverse square law.

Many cases of architectural lighting fall into one or other of these categories.

A Practical Example of a Linear Source.

Suppose, for the sake of example, one has to deal with an interior in which the illumination is nearly all obtained directly from a long length of tubular lamp, it will be readily understood that somewhat unexpected results may be found, unless one is prepared for the peculiarities of such a linear source. Let us take a room lighted by a series of tubular lamps placed end to end so as to make a total length of 36 ft. and having a candle-power of say 3 candles per foot run. The total candle-power of such a tube would be nominally 108. But if the tube is mounted up above so as to run from end to end of the room, one would be misled if one assumed that the illumination underneath could be ascertained by merely dividing 108 by the square of the distance from the tube to the table or floor below. It will be instructive to calculate what the value of the illumination at different distances from the tube will be and this is done in the accompanying table.

TABLE I.

Values of illumination produced at different distances by a length of tubular lamp, 36 ft. long and furnishing 3 candle-power per foot run.

Vertical Distance from Tube (r ft.).	Value of θ in Radians.	$\sin\theta$	Illumination $E = \frac{I_\circ}{2r}(\sin\theta + \theta)$ Foot-candles.
3	2.81	0.333	1.57
6	2.50	0.602	0.77
9	2.22	0.800	0.54
12	1.97	0.923	0.36

It will be seen that the illumination does not at all diminish inversely as the squares of the relative distances, i.e., in the proportions 1:4:9:16, but even with this moderate length of source, more nearly in the proportions 1:2:3:4. Installations depending on the use of long lines of light as sources thus tend towards the condition found with a line-source of infinite length, when the illumination diminishes inversely as the distance, instead of the square of the distance.

We have taken a continuous line of light as an example above, but when we have to deal with a long row of lights, spaced at short intervals, the conditions are very similar.

An Illuminated Ceiling.

As a second example, let us take the case of a room which is approximately circular and is lighted entirely by indirect methods, the source being a ceiling in the form of a disc 36 ft. in diameter—i.e., of a diameter equal to the length of the linear source mentioned above. Let us also assume that the average brightness of this ceiling is 4 candles per sq. ft. (which with a dead white ceiling of good quality is equivalent to an illumination of about 12.6 foot-candles). Proceeding in the same way as before, we will calculate the illumination at various distances under the ceiling.

TABLE II.

Values of illumination furnished at different distances from a uniformly illuminated ceiling in the form of a disc 36 ft. in diameter, with an average brightness of 4 candles per sq. ft.

Vertical Distance from Centre of Disc (h ft.)	$\frac{h}{r}$	$1+\frac{h^2}{r^2}$	Illumination $E=\frac{\pi B}{1+\frac{h^2}{r^2}}$ Foot-candles.
3 ...	0.1666 ...	1.0278 ...	12.24
6 ...	0.3333 ...	1.1111 ...	11.31
9 ...	0.50 ...	1.250 ...	10.05
12 ...	0.6667 ...	1.4444 ...	8.70
24 ...	1.333 ...	2.778 ...	4.52

The instructive thing to be observed from these data is how little the illumination varies at short distances from the ceiling, whilst even at a distance of 9 ft. (which might be taken as the approximate table height in a room 12 ft. high) the illumination (10.05 foot-candles) is very different from the value that a calculation on the inverse square method would suggest (about 50.25 foot-candles). Moreover, as one goes from table level to floor level (i.e. from a distance of 9 ft. to 12 ft.) the change in illumination of 1.3 foot-candles is but small compared with that which would occur if the inverse square law were directly applicable, i.e., 50.25 foot-candles to $\frac{9^2}{12^2} \times 50.25 = 28.2$ foot-candles, a change of 22 foot-candles.

Indirect Lighting Installations.

All such installations, where the light is derived from extensive luminous areas overhead, tend towards the condition that the illumination varies but little as the distance from the source is increased. This, in fact, is one advantage of indirect lighting installations that is apt to be somewhat mystifying to a lighting engineer who is not a mathematician! The degree to which this condition is approached naturally depends upon the dimensions of the room —the resemblance to the "infinitely great luminous-plane" is naturally greater in a room having an extensive overhead luminous area but a relatively small height.

Here again a similar effect is produced by masses of individual lights mounted close together, such as are sometimes used to provide strong illumination under canopies outside places of entertainment, and sometimes in factories where close spacing is adopted and where lights are mounted direct on the ceiling.

In conclusion there is just one caution that should be given in connection with calculations of this type. It is assumed that the line source (and the disc) radiate light according to the cosine law, i.e., according to the formula $I_\theta = I_\circ \cos\theta$. This is approximately true of most illuminated surfaces of a mat character, such as walls and ceilings, but it may not be true in the case of certain forms of modern tubular lamps, especially those of the gaseous type.

[*We are indebted to Mr. H. S. Barlow for the calculations introduced into this article.*—Ed.]

Industrial Lighting with Gas

Gas lighting installation in a London works, showing the lighting of the benches where the assembly and adjustment of small metal parts is carried out.

High-pressure gas lighting in one of the spinning sheds in a Stockport mill.

Gas Lighting in a Modern Factory

The appended illustrations show part of the new Croydon works of Messrs. R. & A. Main, Ltd., which are now gas-lighted.

The types of lamps employed in the factory are as follows:—

"Worklite" (330 M.L.H.C.P.; 4 No. 2 mantles).
Bench Lights (250 M.L.H.C.P.; 3 No. 2 mantles).
"Surbiton" (320 M.L.H.C.P.; 4 No. 2 mantles).
Safety Garage (300 M.L.H.C.P.; 5 No. 2 mantles).

(The lamps displaced by the present installation had not yet been removed at the time the photograph was taken).

The present lamps are controlled by one pneumatic switch on the ground floor and three on the first floor.

Both the stores and the first-floor assembly shop have a floor area of 13,200 sq. ft. and an average height of 13 ft. 8 in. The average illumination for general lighting in both cases is of the order of 5 foot-candles (with a maximum of 7.5 and a minimum of 2.5 foot-candles). For the bench lighting an average value of about 15 foot-candles (max. 18.5 and min. 12 foot-candles) is provided. We have thus a good example of modern practice — moderate general illumination and exceptionally high local illumination added.

In the stores the total mean hemispherical candle-power provided is 15,810, and the gas consumption 482 cub.ft. per hour. In the other case somewhat lower values (14,470 mean lower hemispherical c.p. and 437.5 cub.ft. of gas per hour) prevail owing to the fact that the bench-area is somewhat less and fewer lamps are necessary.

In the auxiliary stores the height of the room is the same, and the floor area 1,800 sq. ft. Here a similar maximum illumination is attained.

Electric Lighting in Works and Offices

Some Notes on the Conference recently arranged at the E.L.M.A. Lighting Service Bureau.

From all accounts this conference was a very successful one, each lecture leading to a keen discussion. Sir John Brooke (vice-chairman of the Electricity Commission) in his opening address truly remarked that one of electricity's greatest contributions to industrial efficiency is lighting, which is just as important an element in cheap and efficient production as the lay-out of machinery or the planning of production.

Mr. W. J. Jones lectured on "The Science of Seeing," once more pointing out the disparity between the order of illumination met with in nature and that prevailing by artificial light. Six different intensisities—5, 10, 20, 50, 75, and 115 foot-candles—were provided in the hall, and over 70 per cent. of those present voted for illuminations in excess of 20 foot-candles.

Sir David Munro, who opened the discussion on the this lecture, commented specially on the conditions in coal mines, where work was done under almost incredibly feeble illumination.

At other meetings Mr. H. Lingard dealt with lighting fundamentals, and Mr. A. D. S. Atkinson with light control, the latter emphasising that an overall efficiency of over 80 per cent. in modern opal glass enclosing fittings is quite a feasible proposition today.

Mr. J. W. Howell, dealing with industrial lighting, presented some instructive calculations. He contended, for example, that the cost of raising illumination up to, say, 20 foot-candles (an approximate "daylight" standards in interiors) would be rewarded by an improvement in output equivalent to 555 per cent. on the invested money—what other investment would show so good a return?

Subsequently, Mr. M. W. Hime described the planning of a factory lighting installation (a topic to be treated in one of the Bureau publications about to be issued), and Mr. R. O. Ackerley, with certain special lighting problems that can only be effectually solved by co-operation between the illuminating engineer and the factory executive.

Mr. H. T. Young

President-Elect of the I.E.E.

Readers will have observed with pleasure that Mr. H. T. Young, who is governing director of Troughton and Young, Ltd., has been nominated as president of the Institution of Electrical Engineering for the coming year.

Mr. Young was a member of council of the Illuminating Engineering Society for three years, and his paper on "Modern Domestic Lighting," read before the society in 1931, gained for him the Leon Gaster Memorial Premium, this being the first occasion on which the award was made.

In connection with "The Lighting Centre" at Knightsbridge, Mr. Young has become prominently identified with progress in the design of lighting fittings and with the effort to combine sound illuminating engineering design with beauty of form.

He has also rendered signal services to the electrical industry in his connection with the Electrical Contractors' Association, the E.D.A., and the Institution—which has now fitly recognised these services by inviting him to occupy the presidential chair.

Street Lighting at Hastings

We illustrate above some ornamental standards of pleasing design recently installed at Hastings. It will be seen from the picture, for which we are indebted to General Electric Co., Ltd., that the central diffusing globe is supported by two small units at the side, a mulitple arrangement that seems likely to become popular for lighting promenades, etc.

Situations Required

We insert below notices on behalf of three of the younger members of the Illuminating Engineering Society who are in want of situations:

Box "A." Age 22. Is a graduate of the Institution of Electrical Engineers and has had four years' college training, followed by practical experience as an assistant to a consultant on lighting problems. Now desires position with firm engaged in consulting work, or with Government Department, railway, or other public service.

Box "B." Age 24. Has concluded a two years' college course in science and now desires a junior position with firm in the lighting industry; specially interested in applications of coloured light.

Box "C." Age 28. Has good technical degrees (M.Sc., A.C.G.I., D.I.C.). Has had experience as draughtsman and designer of lighting fittings and has been responsible for several patents on lighting equipment. Now desires position with engineering firm, preferably associated with heating and lighting.

We shall be glad to hear from any of our readers who may have vacancies or who can suggest opportunities.

Literature on Lighting

(Abstracts of Recent Articles on Illumination and Photometry in the Technical Press)

(Continued from June, Page 185)

II.—PHOTOMETRY.

146. A High-precision Microphotometer.

A. Lallemand. Rev. d'Opt., Vol. 15, No. 3, p. 109, March, 1936.

Describes, with diagrams, a photometer designed to measure the brightness of a non-uniform field. The optical system is so designed that the photo-electric cells used for measurement always receive a field of uniform brightness. R. G. H.

III.—SOURCES OF LIGHT.

147. The Qualities of Incandescent Lamps.

Preston S. Millar. Elect. Engineering, 55, pp. 516-523, May 1936.

Methods of appraising the qualities of electric lamps are discussed in this article. The wide difference in quality between lamps that comply with American specifications and those which do not, and the economic consequences of the use of lamps that are without the benefit of scientific methods are indicated. S. S. B.

148. Notes on Wiring—Lamp Efficiencies.

Megohm. El. Times, 89, p. 678, May 14, 1936.

Points out that when changing from a private low-voltage generating plant to a 230v. supply, the luminous efficiency of the lamps is lower by 15-20 per cent. W. R. S.

149. New Mercury Lamps Being Developed.

Anon. Elect. Engineering, 55, p. 560, May, 1936.

The article, with a photograph, describes two new types of lamp. The first utilises fluorescent powders coating the inside of the lamp, which is tubular. The powders react to u.v. radiation from a mercury discharge, producing a wide range of colours. The second type is a small discharge lamp, operating at extremely high internal pressures, and giving about 3½ times as much light as the average incandescent lamp of equal wattage. Some types require water-cooling. S. S. B.

150. New 250w. Mercury Lamp.

Anon. Magazine of Light, V., pp. 20-21, March, 1936.

A brief description is given of a new 250w. mercury lamp recently developed in America. The efficiency ranges between 25-30 lumens per watt. Specially designed reflectors for this lamp are available. C. A. M

151 Dual Lamps.

J. N. Aldington. Elect., 116, p. 580, May 1, 1936.

Volt-amp. characteristics are given of dual lamps containing mercury and a tungsten filament, and also similar lamps utilising a mixture of mercury, cadmium, and zinc. C. A. M.

IV.—LIGHTING EQUIPMENT.

152. Protective Glass for Welding and Other Industrial Operations.

British Standard Specification, No. 679-1936.

Such protective glasses may be required to afford protection against infra-red, visible and ultra-violet radiation, which are defined in the Specification. Five types of glasses, graded according to the severity of the radiation to which the eye is exposed, are recognised, and the thickness, dimensions, and percentage of light transmitted are stated. J. S. D.

153. Combined Heating and Lighting Fitting.

Anon. El. Times, 89, p. 626, May 7, 1936.

Describes a specially designed ceiling fitting, having 4,500-watt heater elements, and 1,100-watt lamp. A photograph is given. W. R. S.

154. Large Fitting for Leeds University.

Anon. El. Times, 89, p. 675, May 14, 1936.

Describes, with a photograph, a lighting fitting, with a 17 k.w. loading, weighing 2½ tons, designed for use in the Brotherton Library at Leeds. W. R. S.

155. Light Weight Alkaline Cap Lamp.

Anon. El. Times, 89, p. 714, May 21, 1936.

Describes briefly, with a photograph, a new design of miner's-cap lamp. The weight is 5½ lb., and the apparatus is claimed to provide more illumination than the new lighting regulations require. W. R. S.

156. Sectional Steel Poles.

Anon. Elect., 116, pp. 552-553, April 24, 1936.

Details, with photographs, are given of sectional steel poles that may be used as lamp standards. Economy in transport and erection are emphasised. The section is elliptical. C. A. M.

V.—APPLICATIONS OF LIGHT.

157. The Foot-candle Question.

D. V. M. El. Times, 89, pp. 651-652, May 14, 1936.

Notes on the degree of illumination found in domestic interiors, with some practical limits on desirable values. W. R. S.

158. Foot-candle Prescriptions.

M. Luckiesh and F. K. Moss. Magazine of Light, V., pp. 12-15, March, 1936.

A brief summary is given of the manner in which a visibility meter, recently developed by the authors, can be applied. C. A. M.

159. Better Sight Fixture enters Dining Room.

Anon. Magazine of Light, V., pp. 40-41, March, 1936.

Pendant fittings, with surrounding shades of the study-lamp type, but using lamps of higher wattage, are indicative of present-day practice in America. Various types are shown. C. A. M.

160. Industrial Efficiency.

"Works Engineer." Elect., 116, p. 543, April 24, 1936.

A discussion is given of the suitability of the newly marketed 150w. mercury vapour discharge lamp for industrial purposes. Reflectors specially designed for this lamp are also mentioned. C. A. M.

161. Works' Lighting.

Anon. Elect., 116, p. 613, May 8, 1936.

Details of equipment, with results obtained, are given of lighting installations using mercury vapour discharge lamps in a boiler works at Nottingham. C. A. M.

162. Foundry Lighting.
Anon. Elect., 116, p. 516, April 17, 1936.
Details and results are given of a lighting installation employing mercury vapour discharge lamps in a foundry.
C. A. M.

163. Proper Lighting Boosts Card Output.
Anon. El. World, 106, p. 1,380, May 9, 1936.
A brief article reports the increased production and reduced errors in a card-punching office resulting from the introduction of a new combination lamp and record-holder. Some details of the unit are given. S. S. B.

164. Why Should Roadways be Illuminated?
M. Meifredy. Lux, p. 47, April, 1936.
The chief considerations (greater safety, etc.) in favour of better street lighting are set out, and the requirements of the various important routes connecting with Lyons is emphasised. In conclusion, suggestions are made regarding the means whereby the cost of better lighting can be met. J. S. D.

165. Public Lighting in Relation to Vision.
M. Cohu. Lux, p. 53, April, 1936.
In this first instalment of a serial article M. Cohu discusses various visual factors affecting street lighting. The nature of the field of view, the effect of adaptation of the eye and pupillary contraction, the duration of effects of glare, and the Purkinje effect are briefly discussed. Finally, conditions of contrast and the influence of the reflecting surface of the roadway are analysed.
J. S. D.

166. Safety Lighting for Highways.
K. M. Reid and H. J. Chanon. Magazine of Light, V., pp. 5-11, March, 1936.
A summary is given of research conducted by the authors on visibility of street lighting on a model street with mercury, sodium, and tungsten sources. The results have been applied to an actual installation in Ohio. Photographs are given. C. A. M.

167. "Glareless" Street Lighting.
T. H. Carritte. El. World, 106, p. 1,338, May 9, 1936.
The author gives details of a new installation of street lighting at Lynn, U.S.A. Deep reflectors, giving a cut-off at 75° to the vertical, and spun on to the enclosing globe of rippled glass, are used. An increase of 50 per cent. over previous illumination is claimed. S. S. B.

168. Electric Street Lighting.
P. J. Robinson and J. N. Waite. El. Rev., Vol. CXVIII., No. 3,055, p. 852, June 12, 1936.
A paper read at the I.M.E.A. convention at Edinburgh, discussing the administrative and technical problems of street lighting by electricity. The authors advocate the use of gaseous discharge lamps, and insist that good lighting is now available at a cost not much in excess of that of poor lighting. R. G. H.

169. Lighting of Trolley Bus.
H. H. Helmbright and F. B. Lee. Magazine of Light, V., pp. 22-24, March, 1936.
Lamps are inserted in troughs, one to each side, running the full length of the bus. Vertical louvres, at one-inch spacing, screen the lamps from the passengers' view. Troughs and louvres are made of oxidised aluminium. Each trough contains 21 30-watt lamps at one-foot spacing. Approximately 20 foot-candles for reading purposes is claimed. Photographs, with a diagram, are given. C. A. M.

170. The Queen Mary.
Anon. El. Rev., Vol. CXVII., No. 3051, p. 699, May 15, 1936.
Describes, with photographs, the electrical equipment of the Queen Mary. Details of the various novel lighting installations are given, and illustrated with photographs. R. G. H.

171. Lighting of the Queen Mary.
Anon. El. Times, 89, pp. 691-693, May 21, 1936.
Describes, with photographs, the general lay-out and switching, and also the lighting of the main hall, main lounge, the ballroom (in which colour-changing effects are controlled by the tonal qualities of the band), the main restaurant, and the verandah grille. W. R. S.

172. Lighting Features of the Queen Mary.
Anon. Elect., 116, pp. 662-664, May 22, 1936.
A series of photographs of representative examples of lighting equipment on the Queen Mary are given, together with some details. C. A. M.

173. Lighting of Leeds Town Hall.
Anon. El. Times, 89, p. 729, May 28, 1936.
A photograph and description of redecoration recently carried out at Leeds Town Hall. It is claimed that one important feature of the installation is the absence of glare, particularly as affects the occupants of the gallery.
W. R. S.

Flashes

Mr. P. J. Robinson and Mr. J. N. Waite, in their recent paper at the I.M.E.A. Convention in Edinburgh, stated that an average cost of ¾d. per unit was now quite a reasonable one for electric street lighting.

* * *

The Salford Corporation Gas Department is to spend nearly £25,000 on improving its public lighting.

* * *

Improvements in the lighting of the main highway in Airdrie are also to be made, at an estimated cost of £1,000; 1,500 c.p. high-pressure lamps are to be erected on existing tramway standards, every second standard being thus treated at staggered spaces of about 83 yards. Twelve new lamps, making a total of thirty-eight high-pressure lamps in use, will be supplied.

* * *

Neon lighting played an important part at the Aldershot Tattoo, a feature being a set-piece representing Caernarvon Castle.

* * *

Over half a mile of Purley Way, Croydon, was recently equipped with sodium electric discharge lamps, as the first stage towards the whole four miles of road. An experimental stretch was completed as long ago as 1932. Purley Way is stated to have been the first road in this country to experiment with this form of lamp.

* * *

Sodium electric discharge lamps have also been recently adopted in many cities in the North of England. Displays were on view at Edinburgh during the I.M.E.A. Convention, and others were described in the paper by P. J. Robinson and J. N. Waite.

* * *

Posts and island refuges of artificial stone seem to be meeting with approval in rural districts. Special designs harmonising with local conditions are possible and make the road look less like a railway!

* * *

"Electric Light in the School" and "Electric Light in the Office" form the titles of two admirably illustrated booklets issued by the E.L.M.A. Lighting Service Bureau.

* * *

Improvements in the equipment of the Arsenal football ground will include a system of floodlighting—not intended as a substitute for daylight, but to assist the staff to perform their duties irrespective of fog or darkness.

* * *

Rival demonstrations between the electricity and gas companies, who have set up their respective standards and lanterns in the main street, have led to unprecedented brilliance at Alnwick. Tenders are now being considered.

* * *

Contracts for the renewal of public gas lighting have been agreed at Annan, Yattan, Sittingbourne and Milton, and Goring-on-Thames.

Recent Patents

(Abstracts of recent Patents on Illumination & Photometry.)

No. 444,877. "Improvements in Miners' Lamps."

Hailwood, E. A., May 30, 1935.

This specification relates to safety lamps in which the lamp bush is provided with a number of gauze protected air supply openings, which are guarded by a ring having a screwed portion, which is vertically adjustable for regulating and cutting off the air supply. According to the specification the air control ring and associated parts of the lamp are so arranged that the incoming air is caused to travel upwards and downwards, or vice versa, before passing horizontallv through the gauzes.

No. 444,950. "Improvements in and Relating to Electric Discharge Lamps."

The British Thomson-Houston Company, Limited, January 30, 1935. *(Convention, U.S.A.)*

This specification describes a combination lamp unit comprising, connected in series with one another, an incandescible filament, two or more gaseous discharge lamps, each comprising an envelope with electrodes, one of these lamps having a rising starting voltage characteristic, and another having a falling starting voltage characteristic. All these are preferably enclosed within an outer evacuated envelope. One of the discharge lamps may be a high-pressure metal vapour arc lamp, such as a high-pressure positive column mercury vapour lamp, while the other may be a low-pressure positive column or cathodic glow lamp such as a sodium lamp. The low-pressure lamp may be short and have a starting voltage of about 40, which gradually decreases to about 25 in normal working, and the high-pressure lamp may have a starting voltage of about 12, increasing to about 50 in normal operation. Such a construction is suitable for a 110-volt supply, the voltage across the filament varying from 58 to 35. The filament may thus be designed to give useful light over a long life.

No. 445,388. "Improvements in or Relating to Lighting Fittings."

The General Electric Company, Limited, and Damant, E. L. B., February 22, 1935.

According to this specification a lighting fitting, adapted for marking aerodrome boundaries and for guard posts or bollards for traffic control, comprises, attached to the top of a support, a unitary glass member of which the upper portion is transparent or translucent and the lower portion is coated with a reflecting layer, a support for locating a light source in the plane separating the upper and lower portions of the glass member, and a diffusing surface of high reflecting power forming the surface of or surrounding the support, the reflecting lower portions of the glass member and the diffusing surface being so shaped that most of the light incident upon the reflecting lower portion of the glass member is reflected upon the diffusing surface.

No. 446,833. "Improvements in and Relating to Electric Discharge Lamps."

The British Thomson-Houston Company, Limited, and Mitchell, J. H., November 6, 1934.

According to this specification an internal starting electrode of a high-pressure mercury vapour or like discharge lamp is connected with one plate of a condenser disposed within the lamp envelope, the other plate of the condenser being connected with one of the main electrode leads. In a "single-ended" lamp one main electrode lead extends within the envelope throughout the length thereof. This lead may form one plate of the condenser, being covered by a sheet of insulating material which is enclosed by a coating of conducting material forming the other plate of the condenser.

No. 446,290. "Improvements in and Relating to Lamps suitable for Street Lighting."

William Sugg and Company, Limited, Sugg, P. H., Sugg, P. C., and McGibbon, A. R., October 27, 1934.

This specification covers a gas-burning street lamp, comprising a discharge attachment having two oppositely disposed diverging discharge passages, each passage including diverging upper and lower walls and inter-connecting side walls, a transverse opening being formed at the junction of the lower diverging walls through which products of combustion pass before escaping through either of the discharge passages.

A divisional application, No. 446,328, of the same applicants and bearing the same date, covers the combination with a linear light source of pairs of divergent reflectors arranged on opposite sides of the source, with the individual reflectors of each pair respectively above and below the plane of the source and so arranged as to reflect light in both directions along a road.

No. 446,480. "Improvements in or Relating to Electric Incandescent Lamps for Use in Mines and like Locations."

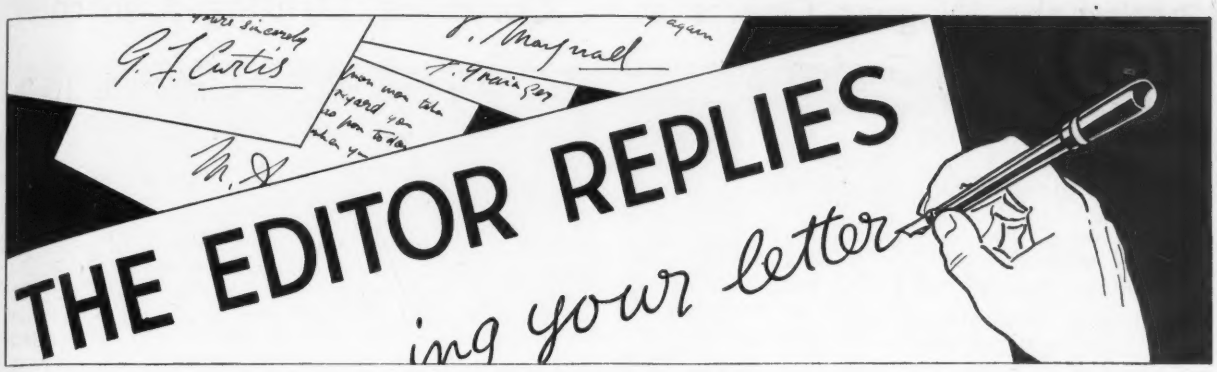
The General Electric Company, Limited, December 12, 1934, *January* 9, 1935. *(Cognate Applications, Convention, Germany).*

According to this specification, in an incandescent lamp bulb for use in mines, etc., one end of the filament is connected to a contact upon the cap and the other end is connected to a lead passing through the envelope at a point remote from the cap and connected to a second contact on the cap by a conductor which is external to the envelope, and is weakened locally so that it will break if the envelope should be broken. Thus, the risk is reduced of live filament leads coming together and, by being heated by the passage of current, igniting gas when the bulb is broken.

No. 446,615. "Electrical Luminous Discharge Device for the Production of Green Light and Glass Tubing for the Manufacture thereof."

Fischer, M., Fischer H., and Fischer, M., August 20, 1935.

A discharge tube for producing green light has a compound glass envelope comprising an inside layer of green luminescent uranium clear glass and a layer of canary yellow or amber glass which absorbs violet and blue rays. The tube is filled with a blue luminous mixture of rare gas and/or metal vapour such as mercury vapour. A layer of ordinary non-luminescent glass may be sandwiched between the uranium glass and the yellow or amber glass. The uranium glass is excited by the blue luminous discharge to green luminescence and the violet and blue radiation is largely suppressed by the yellow or amber glass.



Well—It is All Very Interesting.

We have been asked to mention any **books on photometry** of more recent date than Dr. Walsh's classic volume. In this country there does not seem to have been any subsequent book dealing solely with this subject, though some instructive notes are to be found in some of the chapters of the "Symposium on Illumination," issued by Messrs. Chapman and Hall last year.

One is not infrequently asked for **books on special aspects of lighting** (factory lighting, street lighting, etc.), of which there are few. There does seem a need here—surely there is an opening for an up-to-date book on street lighting?

The chief difficulty, no doubt, is that all aspects of lighting develop with rapidity and soon render books obsolete. Hence in this field it is mainly to papers before technical societies or articles in technical journals that one must look for up-to-date information.

A very searching question has been put to us in regard to **uniformity of lighting,** on which the M.O.T. Committee recently laid stress. It is asked: "Granted that even illumination is desirable, is it expedient to secure it by sacrificing light?" Take, for example, a street receiving a certain flux of light which is unevenly distributed. If by modifying the design of the fitting we can spread this same light more uniformly, this is doubtless an improvement. But suppose we only get uniformity by *cutting off the peaks,* e.g., by blocking some of the light near the lamp, where illumination is usually fairly high, so that we get more even lighting but *less* light. Is this good?

Similarly, suppose that a main street is brightly illuminated and a side street leading into it only dimly lighted. If the lighting of the side street can be improved and the contrast lessened, well and good. But if the contrast is reduced by reducing the light in the main street, would this be wise?

It is difficult to give a satisfactory reply within a small space. Undoubtedly extreme variations in brightness such as give rise to the description **"pools of darkness"** are dangerous. Such extremes are usually due to bad design and can be moderated without undue sacrifice of light. But even pretty considerable changes in illumination are not often dangerous *provided the change is gradual*—at any rate, not sufficiently so as to encourage the practice of diminishing the total volume of light in a street—admittedly all too small in most cases!

A somewhat similar question has been put in regard to **glare.** Is glare of constant value less objectionable than intermittent glare? Here, however, the position is somewhat different. Light is good, and it is a pity to sacrifice it. Glare is bad, and the less of it the better. Even though we admit that sudden exposure of light sources owing to injudicious "cut-offs" may accentuate glare, we are indisposed here to make terms with the enemy.

The note in our last issue on **Plastic Materials** (p. 185) summarised American experience. Inquiries addressed to several experts in this country lead one to infer that whilst these synthetic materials have proved of value for supporting or reflecting elements in fittings, they are unlikely, in the translucent form, to prove serious rivals to glass. Their use in the form of diffusing sheets is fairly successful, but their application to form thin envelopes of pronounced curvature is less so. This is due to certain inherent disadvantages, such as inability to resist heat and tendencies to gradual deformation or surface discoloration with age. Glass surfaces have the very great merit that they are not easily scratched.

The note on **Three-colour Neon** in our last issue (p.189) has also aroused interest. It is, of course, recognised that this method of lighting owes its appeal very largely to novelty and decorative effect. It has, however, been asked how a three-colour installation, such as that described, compares with ordinary standard lighting in terms of efficiency.

Only very approximate figures can be given—there is no need to dwell on the difficulties of heterochromatic photometry. The choice of colours and positions of tubes and the assistance derived by reflection from surroundings are all of some moment. We have been told that with the source of light about ten feet high an illumination of the order of five foot-candles can be furnished with an expenditure of three watts per square foot of floor area, which is not such a bad result for an essentially decorative scheme.

Lastly, we ought to explain that the **combined lighting and heating element** illustrated in our last issue (p. 172) was presented as an ingenious effort of Mr. Leonard Beard to meet somewhat special conditions; but it was not, of course, intended to convey that it was the first or only effort of this kind.

We are reminded of this by an excellent leaflet which has reached us describing various forms of combined heating and lighting units invented and patented by Mr. F. H. Pride in 1930. Several of these have pleasing and graceful forms.

Lighting the Wagner Operas at Covent Garden

by

One of the Audience

No one who witnessed the recent performances of Wagner's "Parsifal" and "Der Ring" at Covent Garden could fail to be impressed by the extreme beauty of some of the scenic effects in which lighting played a dominant part.

The coming of dawn in the forest (Act I. of "Götterdämmerung") was an outstanding example in which full advantage was taken of the cyclorama and of carefully graded dimmers. Although the expert in theatre lighting might regard this as an easy task, and one that put no strain on the stage lighting resources, the effect was undoubtedly very striking, reinforced as it was by Wagner's wonderful tone-painting in the orchestra.

Other scenes where lighting and optical technique played their part were those in which changing clouds and flickering flames were obtained by projection. Incidentally, it may be observed that an impression of flames produced in this manner is a good deal more realistic than the use of a steam cloud illuminated by orange light, which ancient device is still used in some of the scenes. Full scope was given to colour effects throughout, and the changing sky was usually very satisfying.

Having commented on so much that was good in the lighting technique, one feels bound to express some regret that here and there opportunities were missed. For example, in one of the "Parsifal" scenes the stage directions state that "a dazzling ray of light from above strikes upon the chalice, which glows with a deepening purple, shedding a soft radiance on them all." The actual presentation was somewhat crude and seemed like a red colour-sprayed lamp switched on, not quite instantaneously, but through a rapidly changing resistance. Could not some fluorescent device have been used to give a more subtle glow?

Again, in these days of electric fires which flicker most naturally in our homes we expect something rather less quiescent than the fire which plays such an important part in the first act of "Die Walküre." Here are the relevant stage directions, given very explicitly by Wagner, who knew what he wanted:—

"The fire falls together. From the flame which springs up a bright light strikes on the spot in the ash stem where the sword-hilt is now clearly seen."

The required effect would not seem to tax the lighting resources at Covent Garden very heavily, and yet there was no thrill of the gleaming sword-hilt—just a lamp switched on behind a pin-hole in the stage ash tree, or so it appeared.

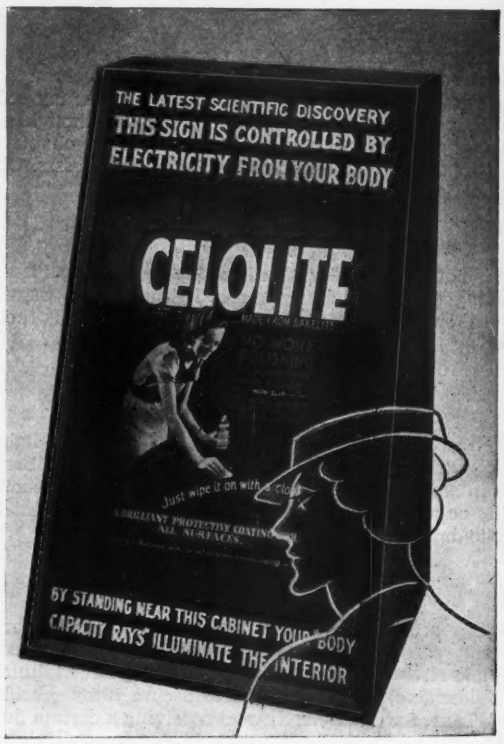
One other disappointment was the absence of the rainbow in the Valhalla scene at the end of "Das Rheingold." We can understand why Brünnhilde's horse is not prominent in the other great closing scene, but there should be no stage difficulties in producing a rainbow bridge. And what a chance for the lighting engineer with his discharge tubes to produce an effect worthy of Wagner's splendid conception!

One looks forward to future performances in which all the beauties of this year's lighting effects will be repeated, but enhanced by even more attention to the subtleties of which light is so easily capable.

Corpatact Lighting Control

Windows that Welcome with Light and Safes that Express Apprehension

We give below the application of an ingenious device developed by the Corpatact Syndicate. This is essentially a highly sensitive control switch actuated by body capacity. If a shop-window is controlled by this device (which may be hidden from view), it lights up automatically when a person approaches—an effect which inevitably attracts attention besides saving current. This idea can be applied to the magic mirror here illustrated. The device is marked out behind, and is ordinarily invisible, so that a plain mirror surface is presented to



A Magic Mirror. The picture and lettering are ordinarily invisible, but appear, brilliantly lighted up, when a person approaches.

view. But when a person approaches, the special switch operates a lamp in the background and immediately the mirror changes its character and becomes a potent advertisement.

A third example of Corpatact magic is a safe which guards itself against the approach of unauthorised persons. With the device duly set, the result of anyone laying a finger on the metal outside of the safe is to put in operation a bell—which continues to ring until the intruder retires to a respectful distance!

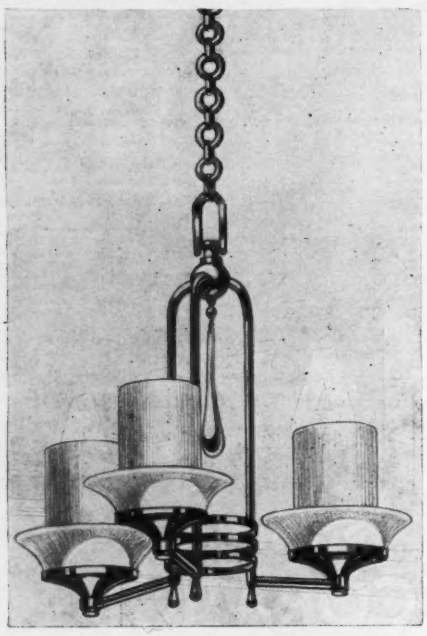
Improved Lighting at Hendon

We learn that the North Middlesex Gas Company has obtained a 15-year contract for the lighting of the portion of Hendon served by that undertaking. Over 2,000 lamps are involved in the contract, which should lead to considerable improvement in the lighting of some of the streets where about 300 6-light modern gas lamps are to be substituted for 3-light lamps.

TRADE NOTES AND NEWS

Variety in Fittings

We illustrate below another fitting that caught our eye during a recent visit to the showroom of the Sun Electric Company, Ltd. This "cup and saucer" design is a novel and graceful one, but there are end-



A pleasing form of Pendant—the "Cup and Saucer" design.

less varieties. It is evident that the chandelier effect —i.e., the use of three or four units as a cluster, as an alternative to one large dish or bowl—is still as popular as ever.

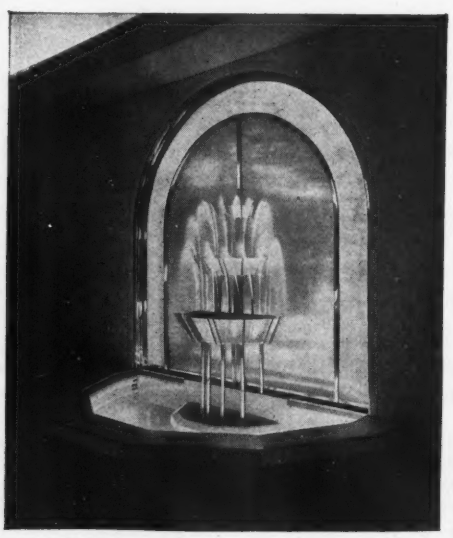
A Gas Microscope Illuminator

Our attention has been drawn to an ingenious device shown at the recent South London Exhibition by the South Metropolitan Gas Company. This is an ingenious combined microscope illuminator and reading lamp fitted with a Metro-Daylight mantle and a shade finished in faint blue enamel, which emphasises the daylight effect.

Planned Lighting

The above illustration of Benjamin Electric, Ltd.'s, stand at the I.M.E.A. Exhibition is interesting as showing the modern tendency. Leading firms in the lighting industry are less inclined to try to make the stand a catalogue of their products. Instead of this they concentrate on *method* and on the production of an arresting display which excites interest much more readily than a forest of lighting fittings.

Neon Lighting for Fountains



Illuminated Fountains are becoming quite a familiar device—so much so that standard forms of equipment for use in gardens may soon be expected. Neon lends itself particularly well for this purpose. The picture above shows a G.E.C. neon illuminated fountain at Messrs. Bobby's Sunshine Restaurant, Bournemouth, installed by Messrs. Aish and Co.

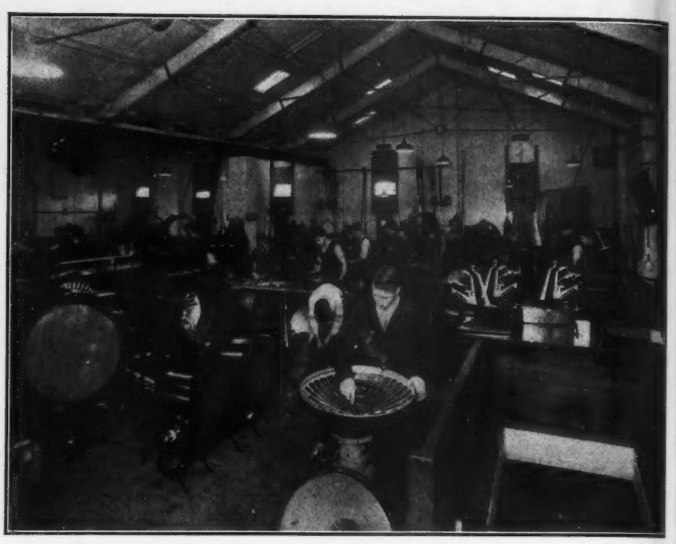
A Visit to the Works of Kandem Electrical, Ltd.

In these compact works a considerable variety of equipment—units for film and photographic lighting, projectors, fittings for commercial and industrial lighting, and more recently, a range of electric motors—is produced.

Readers will recall that the head office of Kandem Electrical, Ltd., has recently been removed to 769, Fulham-road, where showrooms are now being arranged and equipped.

In the works, which are situated at 10, Parsons-green, one was struck by the evidence of organisation which enables a considerable variety of equipment to be handled. Every requisite department is represented (e.g., spinning, machining, welding, metal working, plating, enamelling, etc.), and the arrangements are very elastic, enabling output to be rapidly increased during periods of exceptional demand.

One of the chief sections of the business is the manufacture of equipment for film and photographic lighting, of which the firm makes a speciality. Incandescent units up to 10 kw. in capacity and carbon arc lamps up to 300 amperes capacity are manufactured. (Incidentally, we were given to understand that trouble due to noises of arcs in taking sound-films has now been completely overcome; the firm manufactures several convenient forms of ripple eliminators for silencing arcs.) Incandescent units may be of the single spotlight pattern, but multiple reflector "broadside" equipment, in which a dozen or more lamps in appropriate reflectors are assembled in movable and adjustable frames, are also used. The equipment covers such items as lens spotlights, illuminators utilising optically worked parabolic reflectors and giving a concentrated beam, floodlights, broadside equipment to furnish diffused light, and various special types of special photographic and other lamps. Lens spotlights using arcs are manufactured up to 150 amperes capacity and illuminators with parabolic reflectors up to 300 amperes. The carbon arcs used for broadsides are fully automatic. Some recent types are specially designed for colour cinema-photography.



A section of the assembly shop devoted to Film Studio Lighting Equipment. Typical units and projectors will be seen on the left; in the foreground on the right an operator is seen handling a reflector utilising mirror glass facets, which are secured to the metal back by a special process eliminating breakages by vibration.

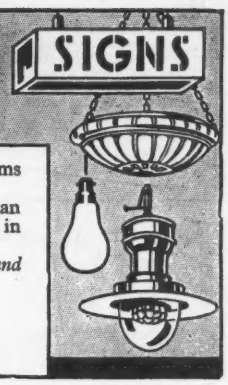
This picture is the result of a snap by an enthusiastic photographer during a visit to the Kandem Works. A corner of one of the assembly shops is seen "parabolically" in a 750,000 candlepower "Incy" Sun.

The fittings developed for domestic, office and factory use are available in a range of distinctive and familiar types. A feature in several instances is the ease with which, by a small modification in design, a fitting can be applied either for direct diffused or indirect lighting. Mention may be made of the "Silvazone" and "Silvabole" types in which dense opal and light opalescent glass are combined; of the "Winlux" reflectors and diffusers for shop-window lighting, interior floodlighting and the illumination of unusually lofty rooms; and the very compact ranges of ceiling and bracket units utilising diffusing glass which the firm has recently introduced. There are also numerous desk lamps, bench fittings, and adjustable units for drawing offices, etc.

The variety of fittings mentioned above should be sufficient to occupy a works of moderate size, especially as practically all the metal work is produced and the reflectors of various contours are spun on the premises. There are, however, other lines of work in course of development. We were interested to notice armatures being wound for a line of motors of small to medium size, which we understand is proving quite a popular series.

·WHERE TO BUY·

A DIRECTORY OF LIGHTING EQUIPMENT



We invite applications for spaces in this new section of the journal. Particulars of terms for each space (approx. 1 inch deep and 3⅓ inches wide) are given below.

These terms are equivalent to **half our ordinary advertising rates**, but not less than 12 successive monthly insertions can be accepted on this basis, and amounts are payable in advance.

Payment for an advertisement in this section entitles the advertiser to receive *Light and Lighting* during the period of the contract.

Terms:					
12 Successive Monthly Insertions	£3 10 0	Payable
24 „ „ „	£6 0 0	in
36 „ „ „	£8 10 0	Advance

1

MODERN LIGHTING FITTINGS

New Catalogue on application

Fittings manufactured to Architects' Specifications

ASCOG LIMITED

Ascog House, 44, Theobalds Road, LONDON, W.C.1

2

PHOTOMETERS

for testing candle-power and illumination. Benches, Cubes, Heads, Standards of Light, Special Fittings and Accessories.

ALEXANDER WRIGHT & CO., LTD.,
1, Westminster Palace Gardens, Artillery Row, Victoria St., London, S.W.1

3

ALLOM BROTHERS LTD.

16, GROSVENOR PLACE, LONDON, S.W.1.

Specialists in the Science of Modern Lighting, including :

Theatres and Public Halls. Tennis and Racquet Courts.
Pictures and Picture Galleries. Floodlighting, etc.
Decorative Fittings in Glass and Metal.

4

MODERN LIGHTING SPECIALIST CONTRACTING

LEONARD J. BEARD

& CONSULTING ENGINEER

524, HIGH ROAD, LEYTONSTONE, E.11

'PHONES : LEY. 3015
NIGHT SERVICE LEY. 1203

5

Take no risks— specify

BENJAMIN PLANNED LIGHTING

THE BENJAMIN ELECTRIC, Ltd., TARIFF ROAD, N.17

6

MAZDA LAMPS and B T H LIGHTING EQUIPMENT

Our Illuminating Engineers will be pleased to advise you on any street or floodlighting problem

THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2

7

BROMFORD

Seamless Steel Lighting Standards

for all requirements

ROMFORD TUBE CO., LTD., ASTON, BIRMINGHAM

8

BOOKS

PLEASE send for Detailed list of Books on Illuminating Engineering and allied subjects, post free, from :

CHAPMAN & HALL, Ltd., 11, Henrietta St., London, W.C.2

9

THE REINFORCED CONCRETE LAMP COLUMNS SPECIALISTS.

CONCRETE UTILITIES, Ltd.
WARE, Herts.

10

DAWSON REFLECTORS

Indoor and Outdoor Floodlights

JENA REFLECTOR FITTINGS

Miss E. H. DAWSON & HENCKEL,
42, Gray's Inn Rd., London, W.C.1

Telephone : Chancery 7751/2

11

Specialists in
ARCHITECTURAL ILLUMINATION AND DESIGNS

DRAKE & GORHAM LTD.

36, GROSVENOR GARDENS, LONDON, S.W.1

Manchester, Glasgow, Hereford and Winchester.

12

ELECTRICITY SERVICES LTD.

Sole Proprietors and Patentees of the "ALL PURPOSES"

TYPERLITE

LOCAL LIGHTING UNITS
86, Cannon St., LONDON, E.C.4
Mansion House 5294 (3 lines)

13

"ESLA"

BI-MULTI AND MULTIPLANE REFLECTORS

Lanterns, Brackets, Columns, Switch and Fuse Boxes, etc., FOR STREET LIGHTING

The Electric Street Lighting Apparatus Co.
The Foundry, Canterbury

14

ELM WORKS, LTD.

Established 1903 Summerstown, London, S.W.17

Suspension Lamps, Lanterns, **REFLECTORS** for **PUBLIC & INDUSTRIAL LIGHTING**
GAS and ELECTRIC

VITREOUS ENAMELLING Sheet Metal Work, Metal Spinning, &c.

Index to "Where to Buy"

N.B.—The numbers are those attached to individual entries in the Directory (See pp. 225-228.)

WANTS: We shall be glad to hear of the Wants of Readers in the way of lamps, fittings and special apparatus—almost all of which could probably be satisfied by one or other of the firms above whose entries appear in "Where to Buy" (pp. 225-228).

Illuminating Engineering Society

NEW LIST OF MEMBERS

In accordance with the usual procedure, a new and revised List of Members of the Society will be issued shortly after the opening of the next session in October next.

Requests for particulars of changes of address have already been circulated to members, who are reminded that any corrections in the existing list should reach the Hon. Secretary not later than the end of the present month (July 31).

Contracts Closed

BRITISH THOMSON-HOUSTON CO., LTD.
H.M. Office of Works.—For the supply of Maz lamps for the next twelve months.

EDISON SWAN ELECTRIC CO., LTD.
H.M. Office of Works.—For the supply of 8,0 lamps.

GENERAL ELECTRIC CO., LTD.
Dundee Corporation.—For twelve months' supp of Osram lamps.
G.P.O.—For Osram automobile lamps.

SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD.
Royal Mail Lines, Ltd.—For Siemens gas-fill and vacuum lamps during the next twe months.

PUBLIC GAS LIGHTING DEVELOPMENTS

Local authorities all over the country are taking steps to improve existing street lighting installations and to choose systems of lighting which will ensure road safety for pedestrians and vehicles alike.

Lamps of low candle power are being replaced by others of a more modern type and with greater illuminating power; the effect of the spacing and the height of lamps on the distribution of light is being carefully considered; the use of reflecting devices is steadily growing; and automatic control of lamps is being rapidly extended.

Most recent public lighting contracts rightly provide for such improvements. Under a new agreement, for example, made by the Ruislip-Northwood U.D.C., extensive modernisation of lighting is to be carried out. This Council, after practical tests with modern methods of lighting (experimental installations were installed on certain roads), chose gas to light the district for the next ten years.

Among the many 1935 and 1936 contracts which specify the use of gas for public lighting may be mentioned the following:—

15-Year Contracts:	*Southall-Norwood, Dagenham.*
10-Year Contracts:	*Ilfracombe, Cambridge, Northampton, Blyth, Margate, Southwark, Wigston, Hayfield, Penge.*
7-Year Contracts:	*Harrow, Wanstead-Woodford, Selkirk, Hatfield.*
5-Year Contracts:	*Wembley, Deal, Brentwood, Falmouth, Walton-on-Thames, Diss, Kidwelly, Egham, Budleigh-Salterton.*

Printed by the Argus Press, Ltd., Temple-avenue and Tudor-street, London, E.C.4, England.

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